



**Fisher**  
**Bioblock Scientific**

Parc d'innovation - BP 50111 - F67403 illkirch cedex

**France**

tél 03 88 67 14 14  
fax 03 88 67 11 68  
email [infos@bioblock.fr](mailto:infos@bioblock.fr)  
[www.bioblock.com](http://www.bioblock.com)

**Belgique / België**

tél 056 260 260  
fax 056 260 270  
email [belgium@bioblock.com](mailto:belgium@bioblock.com)  
[www.bioblock.be](http://www.bioblock.be)

**España**

tfno 91 515 92 34  
fax 91 515 92 35  
email [ventas@bioblock.com](mailto:ventas@bioblock.com)  
[www.es.fishersci.com](http://www.es.fishersci.com)

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# INSTALLATION AND OPERATING INSTRUCTIONS

## Climatic Test Systems

VC 0018    VC 0034    VC 0060    VC 0100    VC 0150

**With MINCON / 32-Controller**



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# 1 INTRODUCTION

## 1.1 General information

This manual shall be read carefully prior to operating the test system in order to avoid malfunctioning and resultant damage.

This manual contains detailed information and directions regarding

- Installation
- Operation
- Mode of operation
- Faults
- Fault rectification
- Please observe the separate operating manual for control unit »Touchpanel«
- Please observe the operating instructions for options in the appendix

## 1.2 For your guidance

Explanation of the symbols and cautionary comments used in this manual:

### 1.2.1 Symbols

- A dash is used for enumerations
  - A dot denotes directions which must be followed by operator and user
- cross-references to drawings, tables and chapters are marked  
→ *designation and (page)*

### 1.2.2 Danger warnings

consist of explanatory remarks with a symbol right next to it.

**DANGER**

*is used, if non-compliance with the instructions may endanger living beings or the environment.*

**WARNING**

*is used, if non-compliance with the instructions may cause damage to the test system or test specimen.*

**NOTE**

*is used to indicate any form of assistance.*

## 1.3 Separate operating instructions

Please observe the separate documentation for the following equipment:

- Control unit »Touchpanel«
- Printer LX 300<sup>1)</sup>
- Interface converter<sup>1)</sup>
- Software SIMPATI<sup>1)</sup>
- Atmospheric pollutant device<sup>1)</sup>

## 1.4 Warranty

- The design of the test system as supplied by us must not be altered.
- No warranty can be given in case of improper use contrary to the instructions in this manual
- The test system has been designed, manufactured and inspected before delivery with all due care in accordance with the EC guidelines as per enclosed declaration of conformity
- The test system conforms to the standards for conducted and emitted interference specified in the declaration of conformity.
- It is imperative for the safety of the test system that the necessary maintenance and repair work should be performed by our service organisation or authorized service outlets
- The user himself can service and clean the test system in accordance with the maintenance schedule → 8.3 (page 60)
- Only use original spares when performing maintenance or repair work
- For translations into other languages the statements and specifications of the German operating instructions are binding

## 1.5 Normal use and application

The test system has been exclusively designed and constructed for temperature and climatic tests.

You can perform testing methods to determine the effects of temperature and humidity on the material properties and reliability of a test specimen.

Improper,  
inadmissible use



### DANGER

*Improper and inadmissible use of the test system means e.g.:*

- Placing inflammable or explosive gases or fluids inside or in the vicinity of the test system
- Placing inflammable, explosive, toxic or corrosive test specimens inside or near the test system
- Placing test specimens, which become potentially hazardous when exposed to the temperature range of the test system, in or near the test system.
- Placing substances, which can create an explosive atmosphere with air, inside or in the vicinity of the test system
- Endangering living beings by allowing them in the test system
- Using the test system for heating or storing food

## 1.6 Safety

### 1.6.1 General information

Certain basic rules must be observed even for reliable safety devices.

Improper and inadmissible use may represent a danger to life and limb of the operator or third parties or result in destruction of the test specimen or the test system.

- Do not remove protective covers
- Do not render safety devices ineffectual
- Do not manipulate safety devices

Such manipulations are particularly dangerous as others know nothing about them and have confidence in the safety of the test system.

### 1.6.2 Requirements to be met by the user

- Operation of the test system may only be performed by trained personnel
- The user must compile an operating manual on the basis of these operating instructions taking the relevant local and plant-internal conditions and the language of the operating personnel into account
- The user must ensure that all personnel working with the test system know and observe the safety instructions
- Work on electrical devices and the refrigerating unit should only be performed by our service or a skilled person authorized by us. The necessary documentation, which is kept in the switchgear cabinet, should only be used by these persons.

The user must ensure that the directions regarding installation and operation of refrigerating plants as per EN 378-1 chap. 5.3, EN 378-2, appendix C, EN 378-4 chap. 4 and 5, are duly observed.

### 1.6.3 Definition of a skilled person

Personnel who, based on their

- Training and
- Experience

are in a position to prevent electricity-related potential hazards or dangers connected with the refrigerating unit.

### 1.6.4 Safety symbols

Please observe the safety symbols on the test system:



#### OPERATING AND SAFETY INSTRUCTIONS

- Carefully read operating instructions before putting the test system into operation
- Observe safety instructions when operating the test system



#### WARNING ABOUT DANGER AREAS

- Observe the danger warnings in the operating instructions



#### WARNING ABOUT DANGEROUS ELECTRICAL VOLTAGE

*Work at these devices to be performed by electrical experts only*

- Set the mains switch to »0«



#### WARNING ABOUT PLUG-AND-SOCKET CONNECTIONS

*Connectors may only be plugged if the test system is switched off.*



#### WARNING ABOUT HOT SURFACES

*The air in the test space as well as the parts exposed to it may be extremely hot*

*Wear safety clothing (gloves, face guard)*



#### WARNING ABOUT HAND INJURIES

*The heat exchanger fins are sharp-edged*

- Wear protective gloves



#### NO DRINKING-WATER

*Demineralized water is required for climatic operation*

- Demineralized water is not drinkable

### 1.6.5 Safety instructions

Thorough knowledge of the operating instructions for the test system as well as the control unit »Touchpanel« is indispensable for operating the test system.

- Follow these instructions:
  - Keep the operating instructions near the test system
  - In addition to these operating instructions, the relevant national laws, regulations and guidelines must be observed when installing and operating the test system.
  - In case of electrically connected test specimens the local and/or national safety regulations must be observed, particularly with regard to equipotential bonding for leakage currents which may be caused by the test specimens.
  - The test space is only protected against excess or low temperatures when the test system is switched on. For this reason, heat-emitting test specimens must never be placed in the test space when the system is switched off. Fire hazard.
  - Connectors may only be plugged when the test system is switched off.
  - Prior to closing the test space door, ensure no one is inside the test space
  - Prior to locking the door lock with the key, ensure no one is inside the test space.

Prior to performing maintenance work, be sure to

- Set the main switch to »0« position  
→ 2.2.8 Main switch panel (page 13)
- Padlock the main switch against accidental switching on
- Lock the door lock while the door is open, and take out the key to prevent accidental closing of the door.
- Provide a safety clearance of > 500 mm between test system and wall, as escape route, in accordance with VDE 0100 Part 729.

#### Maintenance work

#### Safety clearance from wall

When using the entry ports:

### Entry ports

- Observe the safety standards applicable to electrical systems, e.g. IEC 60364-4-41, VDE 0100 part 410 and EN 60204 part 1, as well as the relevant accident prevention regulations
- Only use lines that are resistant to temperature and humidity
- Seal the used entry ports with temperature and humidity-resistant material

### Refrigerants

### Refrigerants

- The refrigerants used (→ *Data on rating plate, page 58*) belong to group L1 according to EN 378. They are not inflammable, nor are they harmful to humans. Refrigerants are heavier than air. Leaking refrigerants will, therefore, accumulate around the floor.
- Should refrigerants be released, please notify our service department or a skilled person authorized by us. Ensure that the site is well ventilated.
- Observe additional safety specifications in the Service Manual



### 1.6.6 Safety devices

The test systems are equipped with the following safety devices:

- Pneumatic spring<sup>3)</sup> to prevent accidental closing of the test space door



#### DANGER

*Prior to performing work in the test space, take the following precautions to prevent persons from being trapped:*

- Lock the catch (1) while the door is open (the hook must be in horizontal position)
- Take out the key (2)



#### WARNING

*For safety's sake, defective locks must be replaced without delay.*

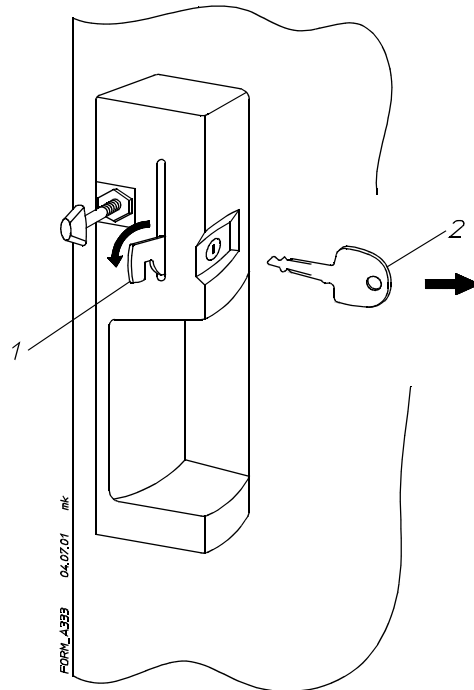


Fig. 1-1  
Door lock

- Excess and low temperature protection
- Excess pressure switch in the refrigeration circuit

**DANGER**

*The safety devices are only working when the test system is switched on*

Safety devices disconnect the test system permanently under the following circumstances:

**Excess temperature**

- Excess temperature in the test space  
(thermal safety class 1 in accordance with EN 60519-2, 1995)

**Excess or low temperature at the test specimen protector**

- Excess or low temperature on the adjustable temperature limiter  
(thermal safety class 2 in accordance with EN 60519-2, 1995)
- Excess temperature in the humidification bath

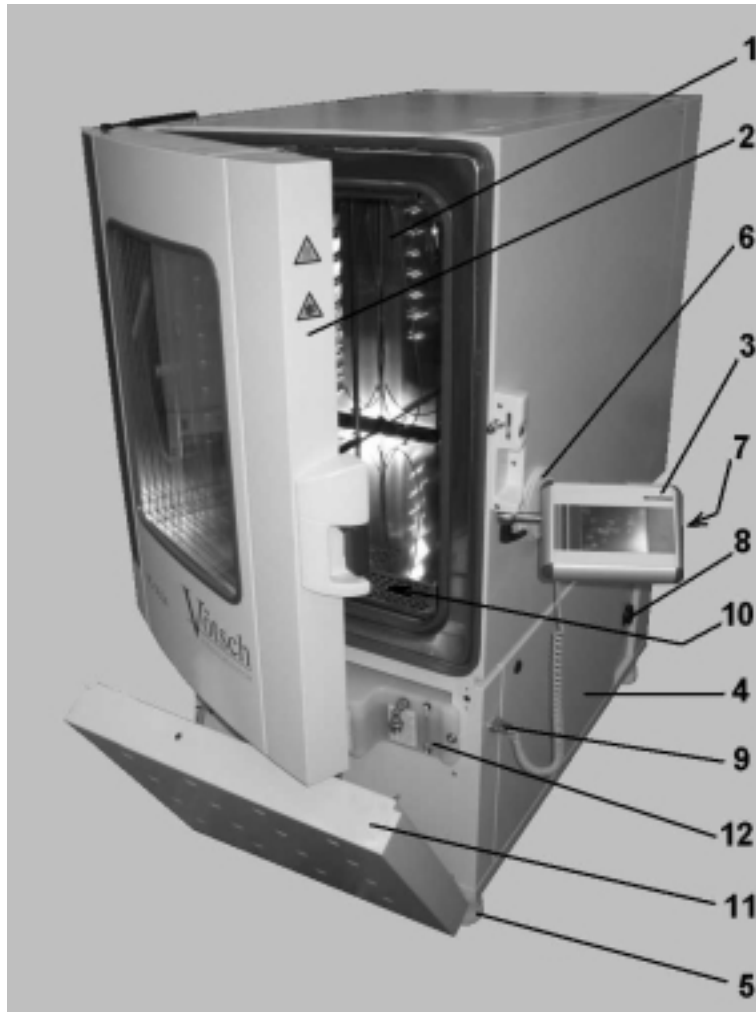
**Excess pressure**

- Excess pressure in the refrigeration circuit

The test systems can be equipped with options. For relevant safety directions see the respective appendices.

## 2 DESCRIPTION OF THE TEST SYSTEM

### 2.1 Structure



*Fig. 2-1  
Test system*

- 1 Test space
- 2 Test space door
- 3 Control unit »Touchpanel«
- 4 Mechanical section
- 5 Feet
- 6 Entry port
- 7 Switchgear cabinet
- 8 Main switch panel
- 9 Connector panel
- 10 Temperature and humidity sensor
- 11 Front flap
- 12 Water reservoir

2.2 Components and their function

→ Fig. 2-1 Test system (page 11)

2.2.1 Test space

Test space

The test space is made of mirror-finish high-grade steel, material no. 1.4301. The test specimens can either be placed on the supplied insert shelf or the test space floor.

2.2.2 Test space door

Test space door

The lock on the test space door can be secured with a key. The door can be equipped with a large window<sup>1)</sup>.

2.2.3 Control unit »Touchpanel«

»Touchpanel«

All control and operating commands can be activated on the control unit »Touchpanel« by touching the respective function symbols.

2.2.4 Mechanical section

Mechanical section

The mechanical section contains the equipment necessary for producing the test conditions. It is accessible by removing the cover sheets. A special key is supplied for locking and unlocking.

2.2.5 Feet

Feet

Adjustable feet are provided to assure ventilation of the mechanical section and to compensate uneven floors.

2.2.6 Entry ports

Entry ports

Entry ports at the right and left side of the test system enable measuring lines and testing equipment to be introduced into the test space

- Observe the relevant safety instructions → *Entry ports (page 8)*

2.2.7 Switchgear cabinet

Switchgear cabinet

The switchgear cabinet contains the system fuses, control modules and electrical components. Forced ventilation of the switchgear cabinet is effected by a fan.

The controller design complies with EN 60204 Part 1.

1) option  
2) not assigned  
3) only for test systems with 600 ltr and more

## 2.2.8 Main switch panel

## Main switch panel

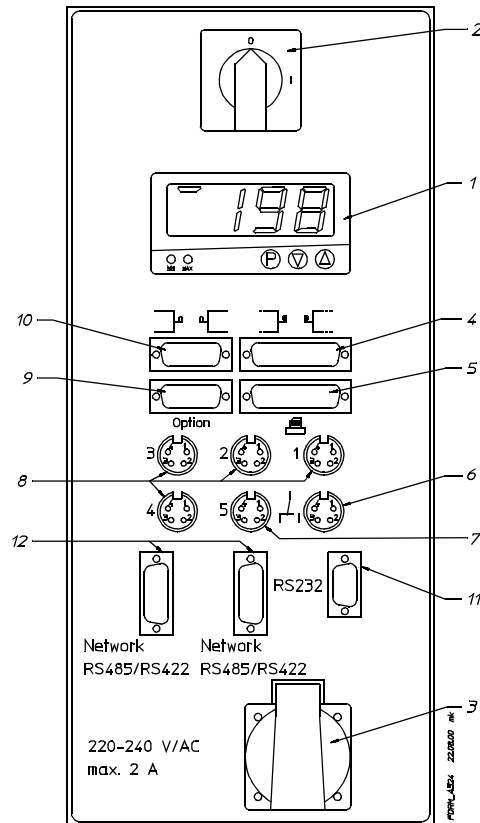


Fig. 2-2  
Main switch panel

The main switch panel contains:

- 1 Adjustable temperature limiter for test specimen protection against excess or low temperatures
- 2 Main switch
- 3 Outlet for a computer or measuring and recording devices or an irradiation unit (options)

Plug for:

- 4 Not assigned

Sockets for:

- 5 Centronics interface
- 6 Potential-free contact → *Appendix: Interface connections*, (page 4)
- 7 Sensor for temperature and humidity measurement<sup>1)</sup>  
→ *Appendix: Interface connections*, (page 3)
- 8 Mobile temperature sensors Pt 100<sup>1)</sup>  
→ *Appendix: Temperature sensors*<sup>1)</sup>
- 9 Optional
- 10 Analog I/O<sup>1)</sup>  
→ *Appendix: Interface connections*, (page 4)

1) option  
2) not assigned  
3) only for test systems with 600 ltr and more

11 Interface RS 232

→ *Appendix: Interface connections (page 1)*

12 Interface RS 485 / RS 422<sup>1)</sup> → *Appendix: Interface connections, (page 2)*

### 2.2.9 Connector panel

#### Connector panel

Further connections are located on the connector panel:

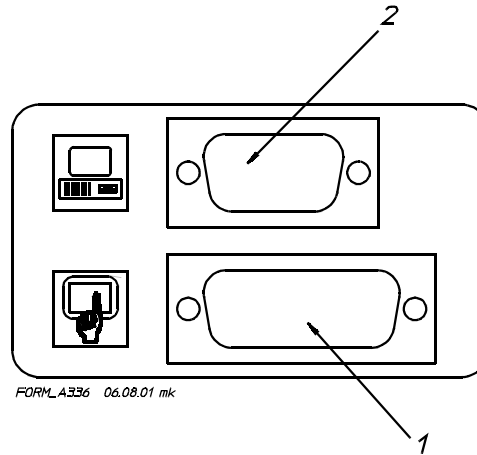


Fig. 2-3  
Connector panel

- 1 Socket for control unit »Touchpanel«
- 2 Not assigned



#### WARNING

*The connecting cables for printer and control unit »Touchpanel« may only be plugged if the test system is switched off*

### 2.2.10 Temperature and humidity sensors

#### Temperature and humidity sensors

The temperature and humidity measuring sensors are located under the insert floor in the test space. They are accessible from the front.

### 2.2.11 Front flap

#### Water reservoir

The reservoir for humidification and psychrometric water is located behind the front flap.

The reservoir is equipped with:

- Outlet connection for overflow and condensation water with integrated pressure compensation
- Connection for automatic water replenishment
- Feed opening with sliding cover for manual water replenishment from a container, e.g. watering can.
- Level indicator

3 TECHNICAL DATA

These figures represent average values of standard test systems, based on an ambient temperature of +25 °C, rated voltage as specified in → 3.3 Operating data (page 16), without test specimen, without options.



**NOTE**  
*The dimensions are specified in the layouts  
→ 4.1 Preparing the place of installation (page 21)*

3.1 General characteristics

Climatic test system		Unit	VC 0018	VC 0034	VC 0060	VC 0100	VC 0150
Test space volume	approx.	ltr	190	335	600	990	1540
Weight (without optional accessories)		kg	380	410	540	760	830

Table 3-1  
General characteristics

3.2 Mechanical loads

Climatic test system		Unit	VC 0018	VC 0034	VC 0060	VC 0100	VC 0150
Maximum load (evenly distributed over the whole surface)							
on test space floor		kg	60	60	80	150	150
on each insert shelf		kg	30	30	40	50	50
total shelf load		kg	80	80	80	100	100

Table 3-2  
Mechanical load

1) option  
2) not assigned  
3) only for test systems with 600 ltr and more

3.3 Operating data

Climatic test system		VC 0018	VC 0034	VC 0060	VC 0100	VC 0150
	Unit					
Test space illumination <sup>1)</sup>		Halogen bulb 24 V, 50 W				
Emitted interference, Interference immunity		see declaration of conformity				
Rated voltage		1/N / PE AC 230 V ± 10 % 50 Hz or 1/N / PE AC 254 V ± 10 % 60 Hz				
Rated power	kW	2.3	2.3	2.3	2.3	2.3
Rated current	A	10	10	10	10	10
On-site fuse protection		16A slow				
Protection class						
Test system		IP 22				
Switchgear cabinet and control unit		IP 54				
Energy consumption	kWh/24h	6	6	6	6	6
Heat dissipation on air-cooled test systems						
max. heat dissipation to environment	W	1200	1200	1200	1200	1200
mean heat dissipation to environment	W	500	500	500	500	500

Table 3-3  
Operating data



3.4 Noise measurement

in accordance with DIN 45635 (Part 1 accuracy class 2)

Climatic test system		VC 0018	VC 0034	VC 0060	VC 0100	VC 0150
	Unit					
Sound pressure level approx. measured at a distance of 1 m from the front, 1 m in height, free-field measurement	dB(A)	47	47	47	47	47

Table 3-4  
Noise measurement

3.5 Characteristics for temperature tests

Climatic test system		VC 0018	VC 0034	VC 0060	VC 0100	VC 0150
	Unit					
Temperature range	°C	-10 to +90	-10 to +90	-5 to +90	0 to +90	0 to +90
Temperature differences (after stabilisation, according to IEC 60068-3-5)						
Temperature fluctuation, temporal (in centre of working space)	K	± 0.1 to ± 0.5				
Temperature deviation, spatial (equivalent to temperature gradient)	K	± 0.5 to ± 1 (1 to 2)				
Rate of temperature change (according to IEC 60068-3-5)						
Heating	K/min	0.6	0.6	0.5	0.4	0.4
Cooling	K/min	0.3	0.3	0.2	0.2	0.2
Heat compensation (for range +20 °C to +50 °C)	W	200	200	200	200	200

Table 3-5  
Characteristics for temperature tests

1) option  
2) not assigned  
3) only for test systems with 600 ltr and more

3.6 Characteristics for climatic tests

- 3.6.1 Humidity diagram (page 19)

Climatic test system		VC 0018	VC 0034	VC 0060	VC 0100	VC 0150
	Unit					
Humidity system						
contents of reservoir	approx.	litr		20		
water quality				demineralized		
pH-value				6 – 7		
conductivity	max.	µs/cm		10		
water consumption at constant +40 °C, 92 %r.h.		litr/24 h		2		
Temperature range		°C		+10 to +90		
Humidity range (r.h.: relative humidity)		% r.h.		10 to 98		
Temperature and humidity differences (after stabilisation, according to IEC 60068-3-5 )						
Temperature fluctuation, temporal (in centre of working space)		K		± 0.1 to ± 0.3		
Temperature deviation, spatial (equivalent to temperature gradient)		K		± 0.5 to ± 1 (1 to 2)		
Humidity fluctuation, temporal (in centre of working space)		% r.h.		±1 to ±3		

Table 3-6  
Characteristics for climatic tests

### 3.6.1 Humidity diagram

The following humidity range is available.

- standard range (with bold edge)

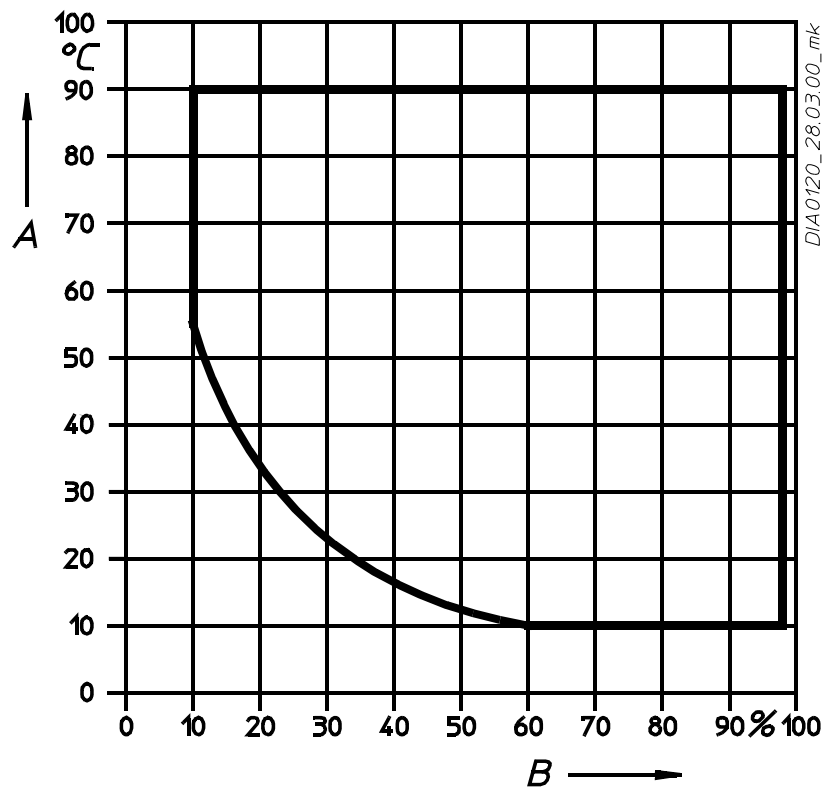


Fig. 3-1  
Humidity range

A = test space temperature in °C

B = relative humidity in % r.h.

1) option  
2) on climatic test systems only  
3) only for test systems with 600 ltr and more

## 4 PREPARATION FOR INITIAL OPERATION

### 4.1 Preparing the place of installation

#### 4.1.1 Installation requirements

Ensure that the place of installation meets the following requirements:

- Rooms must be dry and ventilated
- A minimum volume of 2.5 m<sup>3</sup>/kg of refrigerant is necessary.  
For quantity of refrigerant → *Data on rating plate (page 58)*
- If open flames or similarly hot surfaces are used on site, adequate ventilation must be provided due to potential leaks and decomposition products caused by refrigerants.
- Max. pollution degree 2 according to DIN EN 50178
- Altitude <1000 m above mean sea level
- Do not expose the test system to direct sunlight
- Avoid installing in the vicinity of heat sources
- Permissible ambient temperature for operation: +10 °C to +35 °C
- Permissible storage temperature: -25° C to +55 °C
- Relative atmospheric humidity: 75 % max.



#### WARNING

- Observe the safety instructions  
→ *1.5 Normal use and application (page 4)*

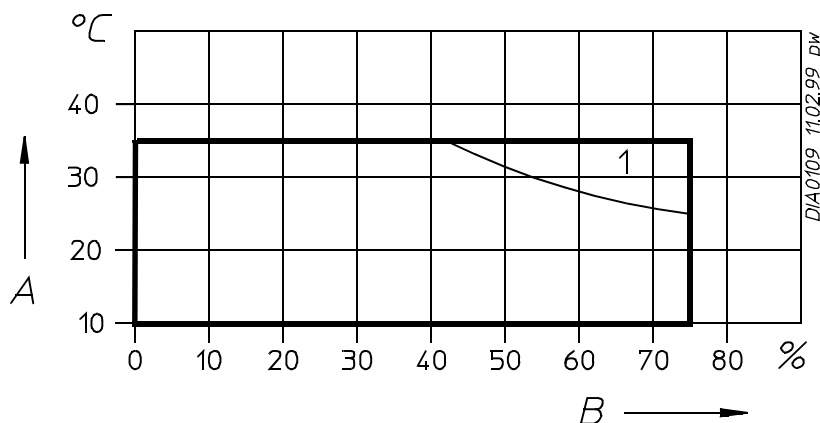


Fig. 4-1  
Installation requirements

A = ambient temperature in °C

B = relative humidity in %



#### NOTE

Low test space temperatures, in conjunction with environmental conditions according to range 1, may cause condensation on the surface of the test system.

#### 4.1.2 Floor requirements

Ensure the floor is:

- Suitable for the weight of test system and test specimens
- Horizontal with an even surface (slight unevenness may be compensated by adjusting the feet accordingly)

#### 4.1.3 Space requirements

The space requirements depend on the size of the test system.

→ Fig. 4-2 Layout VC 0018 (page 23)

→ Fig. 4-3 Layout VC 0034 (page 24)

→ Fig. 4-4 Layout VC 0060 (page 25)

→ Fig. 4-5 Layout VC 0100 (page 26)

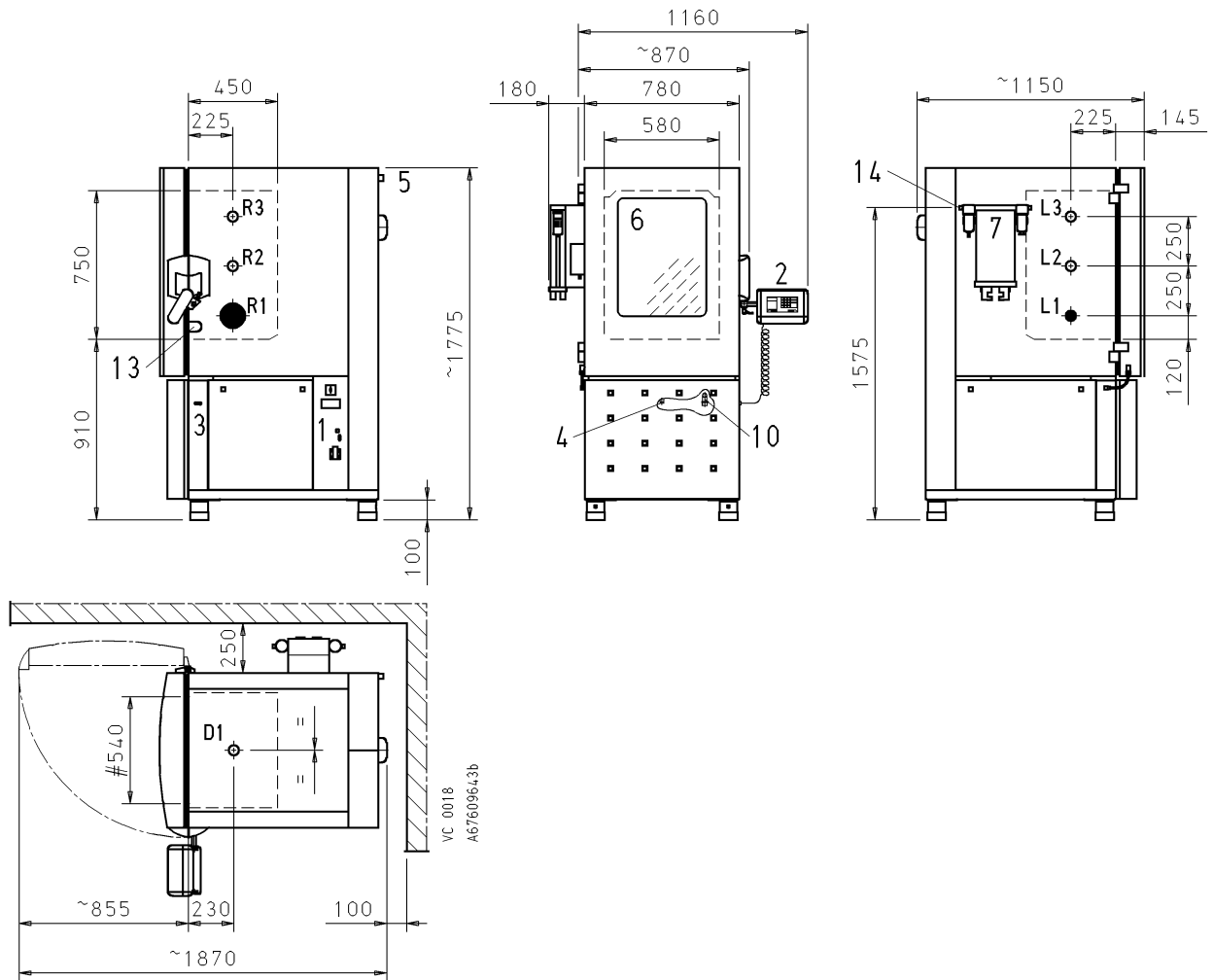
→ Fig. 4-6 Layout VC 0150 (page 27)



#### WARNING

*Be sure to maintain the required distance from the wall.*

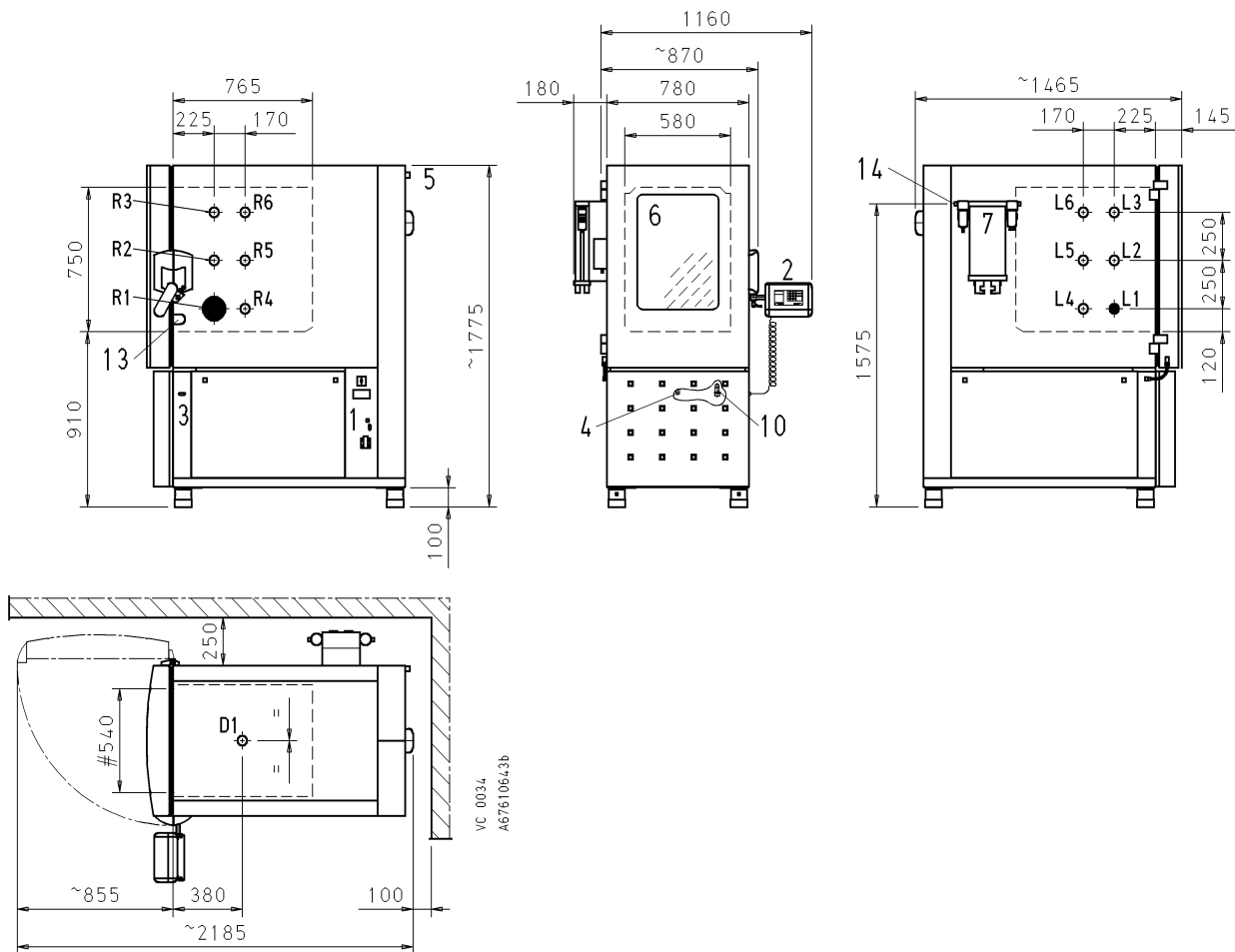
**VC 0018**



- 1 Entry port installed in basic version  
R1: NW 125 mm  
L1: NW 50 mm  
R2<sup>1)</sup>..... additional installation position, right  
L2<sup>1)</sup>..... additional installation position, left  
D1<sup>1)</sup> installation position in the ceiling
- 1 Main switch panel
- 2 Control unit »Touchpanel«
- 3 Connector panel
- 4 Connection for overflow and condensate drain
- 5 Electrical connection, cable length approx. 3.5 m
- 6 Door with window <sup>1)</sup>
- 7 Compressed-air dryer<sup>1)</sup>
- 10 Connection for automatic water replenishment
- 13 Notch port<sup>1)</sup>
- 14 Connection for compressed air<sup>1)</sup>
- # Distance between shelf supports

Fig. 4-2  
Layout VC 0018

VC 0034

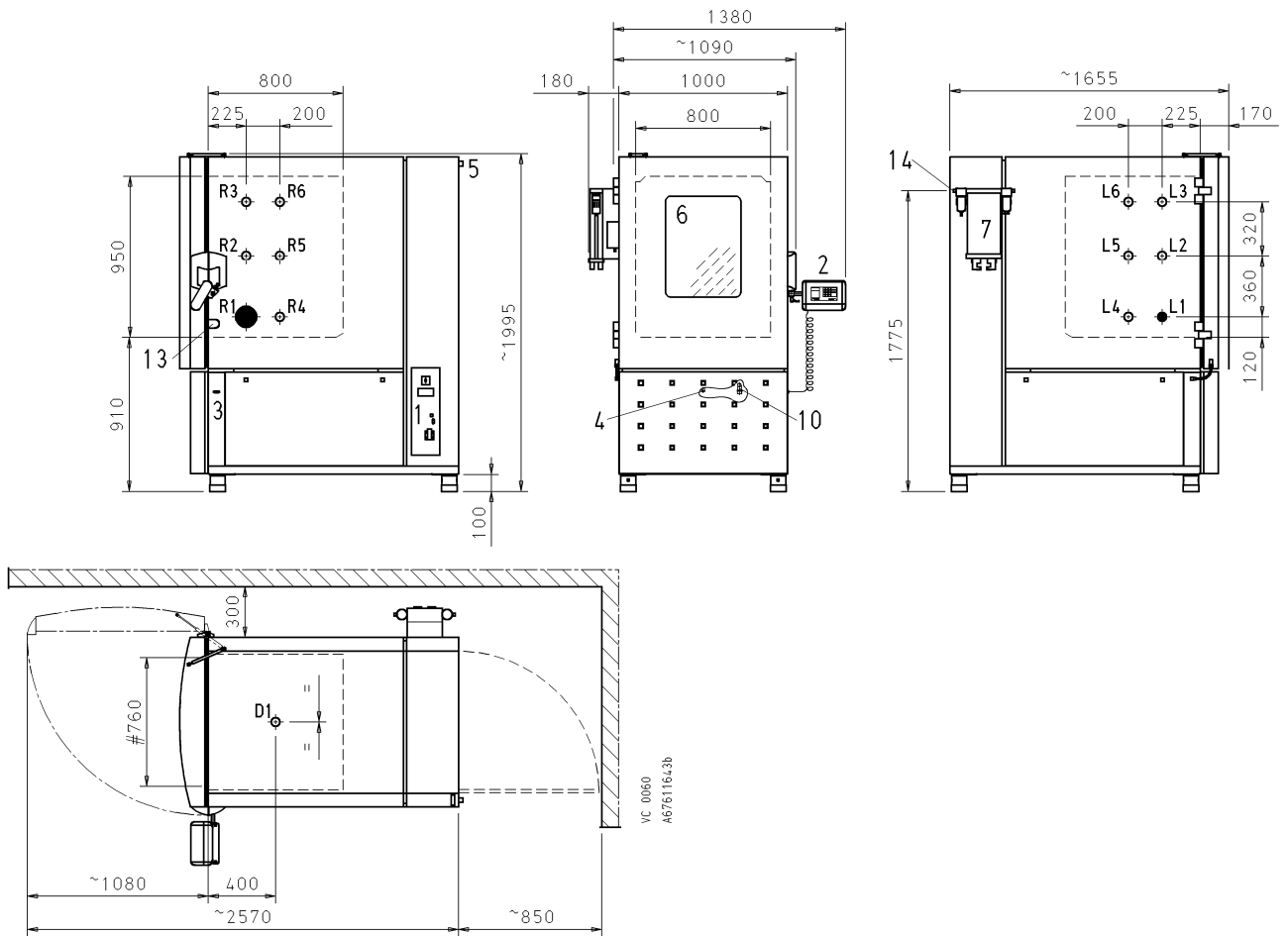


- 1 Entry port installed in basic version  
R1: NW 125 mm  
L1: NW 50 mm  
R2<sup>1)</sup>..... additional installation position, right  
L2<sup>1)</sup>..... additional installation position, left  
D1<sup>1)</sup> installation position in the ceiling
- 1 Main switch panel
- 2 Control unit »Touchpanel«
- 3 Connector panel
- 4 Connection for overflow and condensate drain
- 5 Electrical connection, cable length approx. 3.5 m
- 6 Door with window
- 7 Compressed-air dryer<sup>1)</sup>
- 10 Connection for automatic water replenishment
- 13 Notch port<sup>1)</sup>
- 14 Connection for compressed air<sup>1)</sup>
- # Distance between shelf supports

Fig. 4-3  
Layout VC 0034



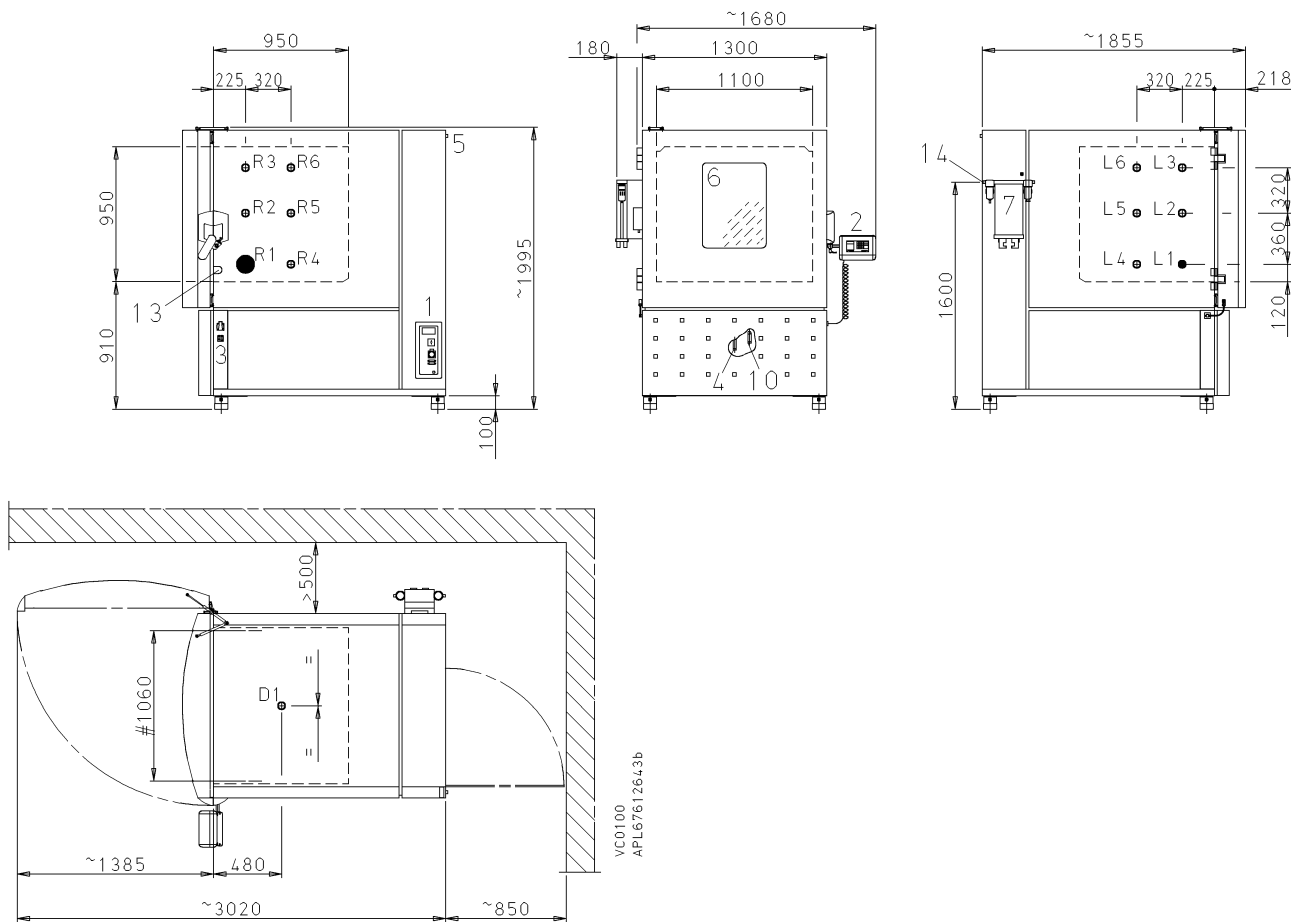
## VC 0060



- 1 Entry port installed in basic version  
R1: NW 125 mm  
L1: NW 50 mm  
R2<sup>1)</sup>..... additional installation position, right  
L2<sup>1)</sup>..... additional installation position, left  
D1<sup>1)</sup> installation position in the ceiling
- 1 Main switch panel
- 2 Control unit »Touchpanel«
- 3 Connector panel
- 4 Connection for overflow and condensate drain
- 5 Electrical connection, cable length approx. 3.5 m
- 6 Door with window <sup>1)</sup>
- 7 Compressed-air dryer<sup>1)</sup>
- 10 Connection for automatic water replenishment
- 13 Notch port<sup>1)</sup>
- 14 Connection for compressed air<sup>1)</sup>
- # Distance between shelf supports

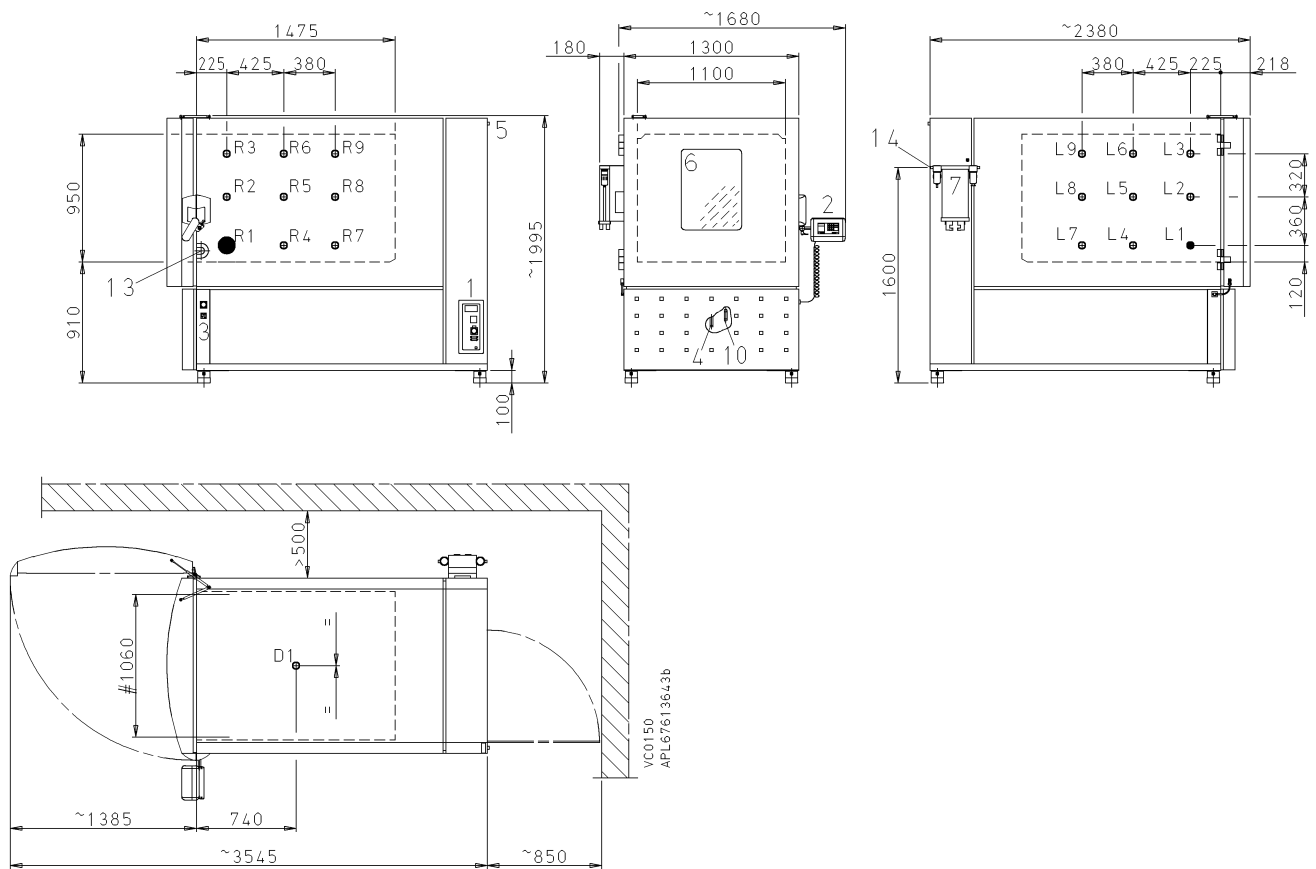
Fig. 4-4  
Layout VC 0060

# VC 0100



- 1 Entry port installed in basic version  
R1: NW 125 mm  
L1: NW 50 mm  
R2<sup>1)</sup>..... additional installation position, right  
L2<sup>1)</sup>..... additional installation position, left  
D1<sup>1)</sup> installation position in the ceiling
- 1 Main switch panel
- 2 Control unit »Touchpanel«
- 3 Connector panel
- 4 Connection for overflow and condensate drain
- 5 Electrical connection, cable length approx. 3.5 m
- 6 Door with window <sup>1)</sup>
- 7 Compressed-air dryer<sup>1)</sup>
- 10 Connection for automatic water replenishment
- 13 Notch port<sup>1)</sup>
- 14 Connection for compressed air<sup>1)</sup>
- # Distance between shelf supports

Fig. 4-5  
Layout VC 0100

**VC 0150**

- 1 Entry port installed in basic version  
R1: NW 125 mm  
L1: NW 50 mm  
R2<sup>1)</sup>..... additional installation position right  
L2<sup>1)</sup>..... additional installation position, left  
D1<sup>1)</sup> installation position in the ceiling
- 1 Main switch panel
- 2 Control unit »Touchpanel«
- 3 Connector panel
- 4 Connection for overflow and condensate drain
- 5 Electrical connection, cable length approx. 3.5 m
- 6 Door with window <sup>1)</sup>
- 7 Compressed-air dryer<sup>1)</sup>
- 10 Connection for automatic water replenishment
- 13 Notch port<sup>1)</sup>
- 14 Connection for compressed air<sup>1)</sup>
- # Distance between shelf supports

Fig. 4-6  
Layout VC 0150

## 4.2 Transporting the test system

A fork stacker or other suitable lifting equipment with adjustable fork width is necessary for lifting and transporting the test system.



### WARNING

- Do not apply straps
- You can lift the test system from the front or from behind, provided the fork (Y) is at least 500 mm longer than half the depth of the test system (X) as specified in the layout.
  - Fig. 4-2 Layout VC 0018 (page 23)
  - Fig. 4-3 Layout VC 0034 (page 24)
  - Fig. 4-4 Layout VC 0060 (page 25)
  - Fig. 4-5 Layout VC 0100 (page 26)
  - Fig. 4-6 Layout VC 0150 (page 27)
- You may lift the test system from the side if the fork is long enough to support the entire width of the test system.



### NOTE

Test systems up to 600 ltr must be lifted from the front or from behind to enable the pallet to be detached.

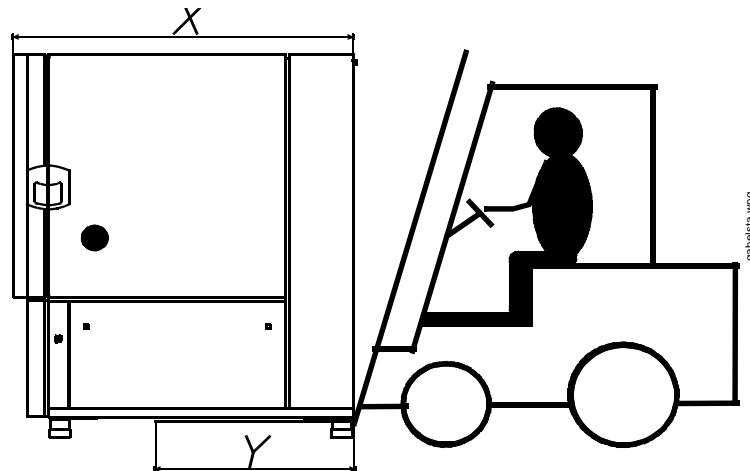


Fig. 4-7  
Fork stacker

- Position the fork under the test system
- Adjust the fork width
- Raise the test system by approx. 50 mm
- Transport the test system to the place of installation
- Unpack it in accordance with instructions
- The packing material should be disposed of according to regulations

### 4.3 Installing the test system



#### WARNING

The test system must be operated with mounted feet or castors to ensure ventilation of the mechanical section.

#### 4.3.1 Test system with feet

- Horizontal alignment is achieved by turning the feet. Use a spirit level.

**Feet**

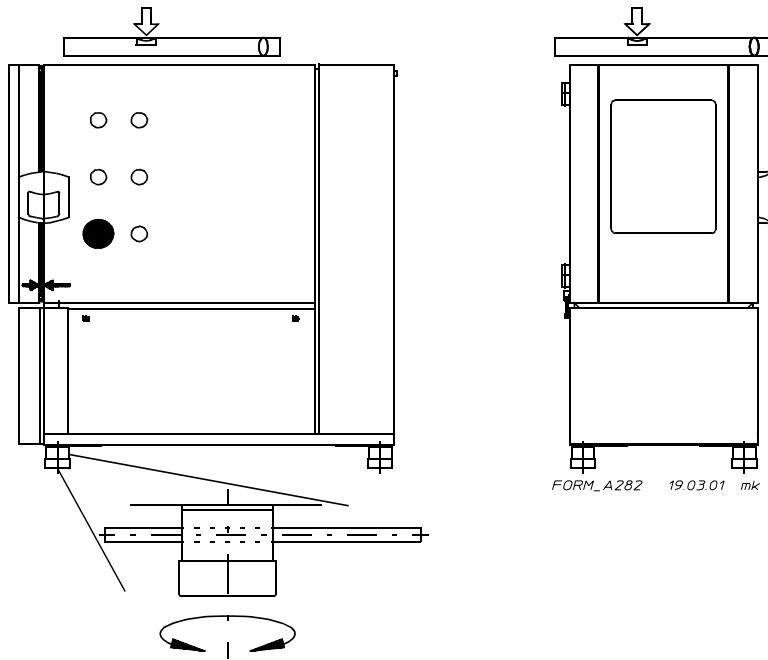


Fig. 4-8  
Adjusting test systems with feet



#### NOTE

Raising the test system with a fork stacker facilitates horizontal aligning.

### 4.3.2 Mobile<sup>1)</sup> test systems

#### Castors

- Take the test system to the place of installation
- Apply the wheel brakes
- Turn the feet to compensate any floor unevenness and relieve the castors
- Use a spirit level for horizontal alignment

Mobile test systems up to 340 ltr are supplied with two detached feet. Please fix them as follows:

- Take the feet out of the test space
- Raise the test system carefully with a fork stacker
- Insert one foot each in the threads provided at the rear right and left. Ensure the feet are securely mounted.

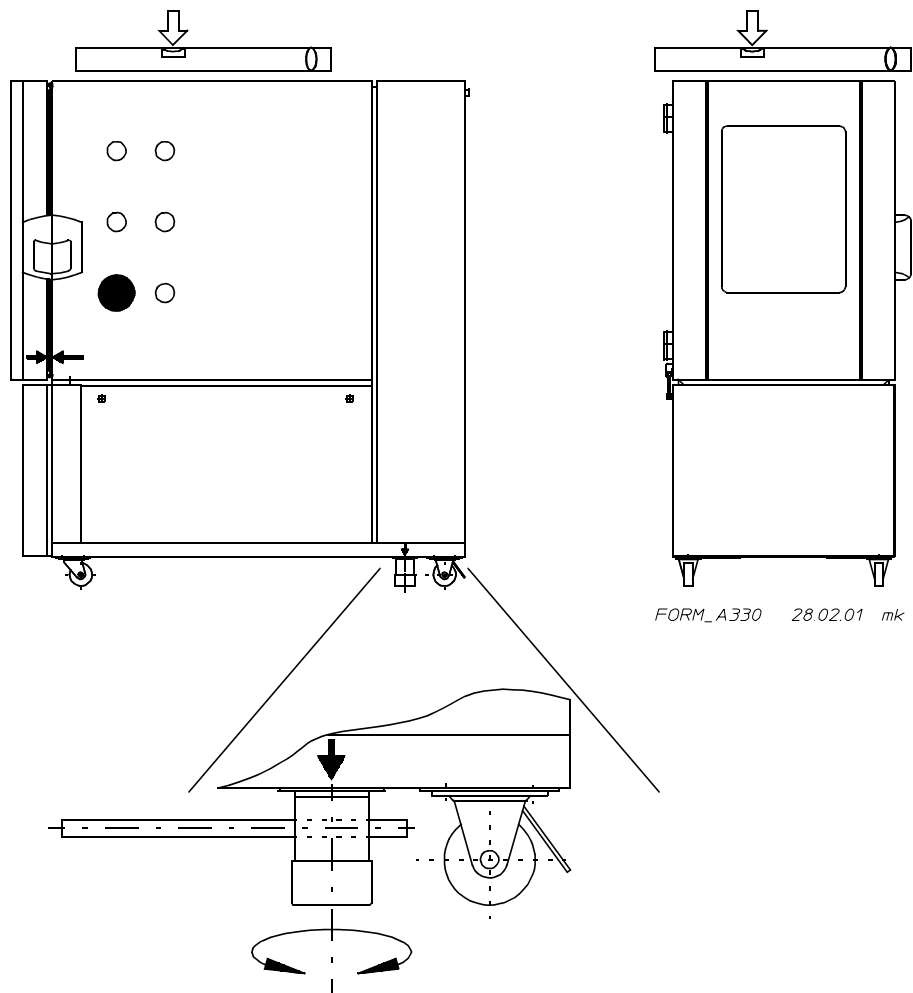


Fig. 4-9  
Adjusting mobile test systems

### 4.3.3 Aligning the test space door

After removal of the transport securing device, the arrow at the door must be in true alignment with the arrow at the test space housing. This is essential for correct functioning of the door lock  
→ Fig. 4-8 (page 29) or → Fig. 4-9 (page 30).

If the arrows are not in line, adjust the test system by turning the feet → 4.3.1 Test system with feet (page 29) or → 4.3.2 Mobile<sup>1)</sup> test systems (page 30).

### Door lock

## 4.4 Location of supply connections

All supply connections are located behind the front flap

### 4.4.1 Supply connections

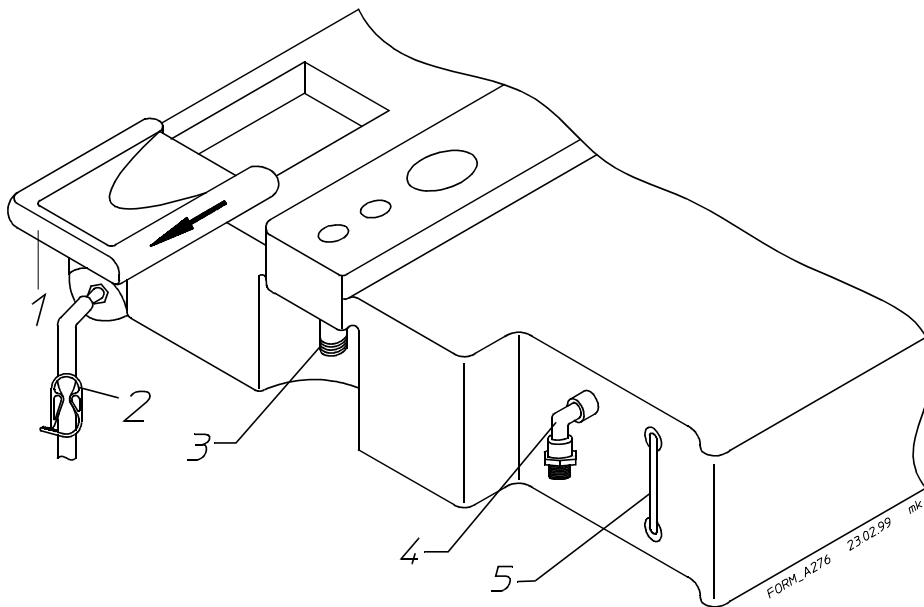


Fig. 4-10

Supply connections on reservoir

- 1 Feed opening for humidification water
- 2 Hose clip for reservoir drain
- 3 Connection for overflow and condensate drain, outlet connection 3/4"
- 4 Connection for automatic water replenishment, external thread R 3/4"
- 5 Level indicator

## 4.5 Setting up the supply connections

### Connecting the over-flow and condensate drain

Proceed as follows:

- Fix a hose to the outlet connection (3)  
→ 4.4.1 Supply connections (page 31)
- Secure with a hose clamp
- Lead the hose underneath the test system toward the rear
- Lead the hose to a floor outlet without bending it. The water should flow by gravity.
- Use a pressure-proof hose to connect the demineralized water network or the demineralization unit<sup>1)</sup> to connection (4) → 4.4.1 Supply connections (page 31)

### Connecting the automatic water replenishment



#### WARNING

*When using the automatic water replenishment or a demineralization unit<sup>1)</sup>, the test space drain must always be connected to a floor outlet.*

- The maximum admissible water pressure is 6 bar g
- For quality of humidification water  
→ 3.6 Characteristics for climatic tests (page 18)



#### WARNING

*It is advisable to install a water stop or sensor device in the humidification water supply line, as a precaution against damage by water. Such safety devices are available at your stockist.*



## 4.6 Transport securing device

The test space door is provided with a transport securing device which varies according to the type of test system.

- Open the test space door and the front flap  
→ *Fig. 2-1 Test system (page 11)*
- Remove the lateral cover sheets  
→ *Fig. 2-1 Test system (page 11)*

### 4.6.1 Transport securing device on test space door of test systems up to 340 ltr

Door securing device  
up to 340 ltr

- Unbend lug (1) (by hand)
- Use fork wrench to undo hexagon screw (2) on the reservoir
- Detach transport securing device in direction of arrow
- Fasten hexagon screw (2)

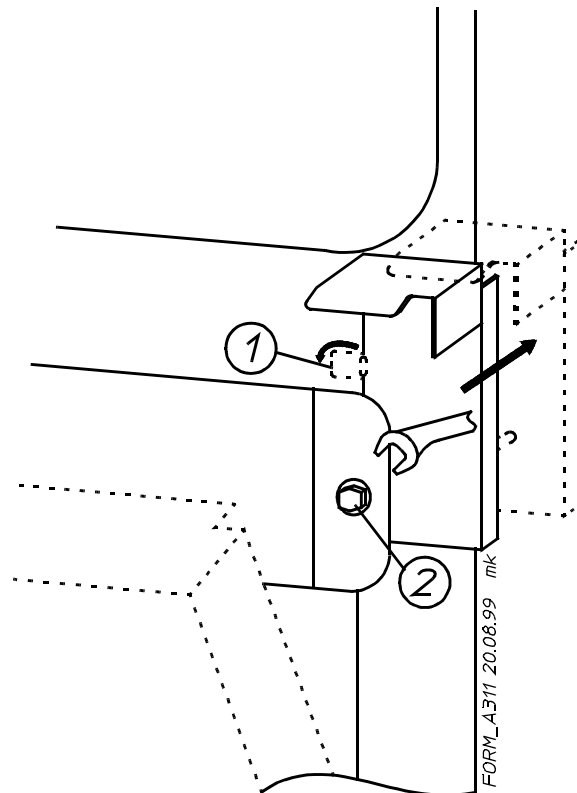


Fig. 4-11

Door securing device on test systems up to 340 ltr

#### 4.6.2 Transport securing device on test space door of test systems up to 600 ltr

##### Door securing device up to 600 ltr

- Undo screws (1)
- Detach transport securing device

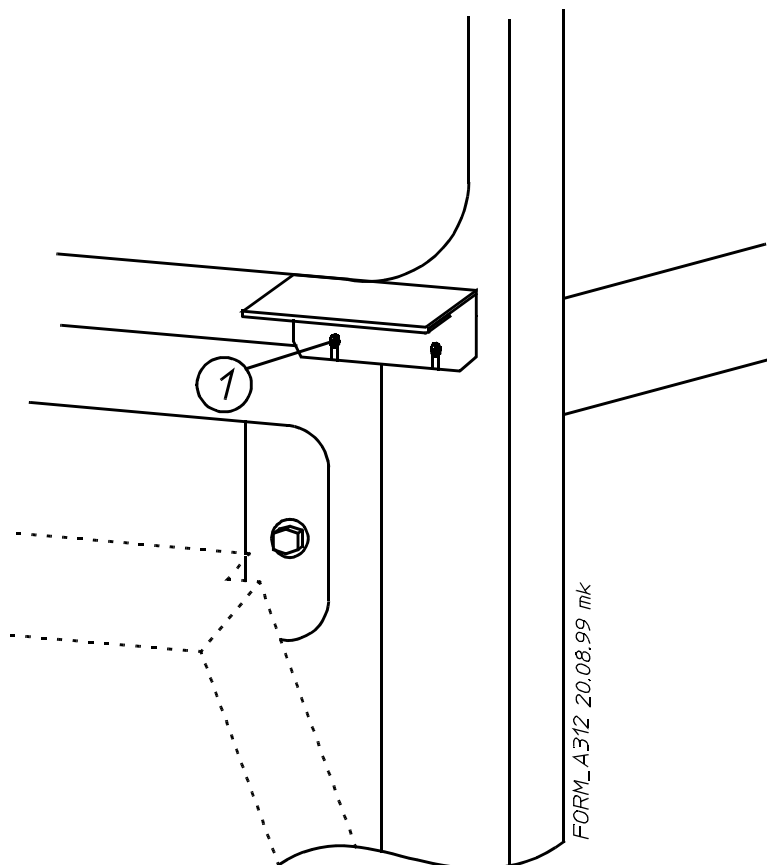


Fig. 4-12

Door securing device on test systems up to 600 ltr

## 4.7 Setting up the power supply

Ensure that

- The mains voltage and frequency correspond to the specifications on the rating plate
- The mains fuse is adequate

**Power supply**



### WARNING

If the on-site mains voltage and frequency differ from our standard values as per chap. 3 *Technical Data (page 15)*, the test system must be connected by a skilled person in accordance with the “Special voltage” manual enclosed.

**Special voltage<sup>1)</sup>**

- Connect the test system to the mains supply
- Set the main switch to »I«



### WARNING

*If the test system is supplied without mains plug, the mains connection must be set up in accordance with → Appendix: Variable-speed test space fan<sup>1)</sup>.*



### NOTE

*The test system must be started beforehand in accordance with the separate operating manual for the control unit »Touchpanel«*

## 4.8 Fitting the control unit »Touchpanel«

### Control unit

Install the control unit as follows:

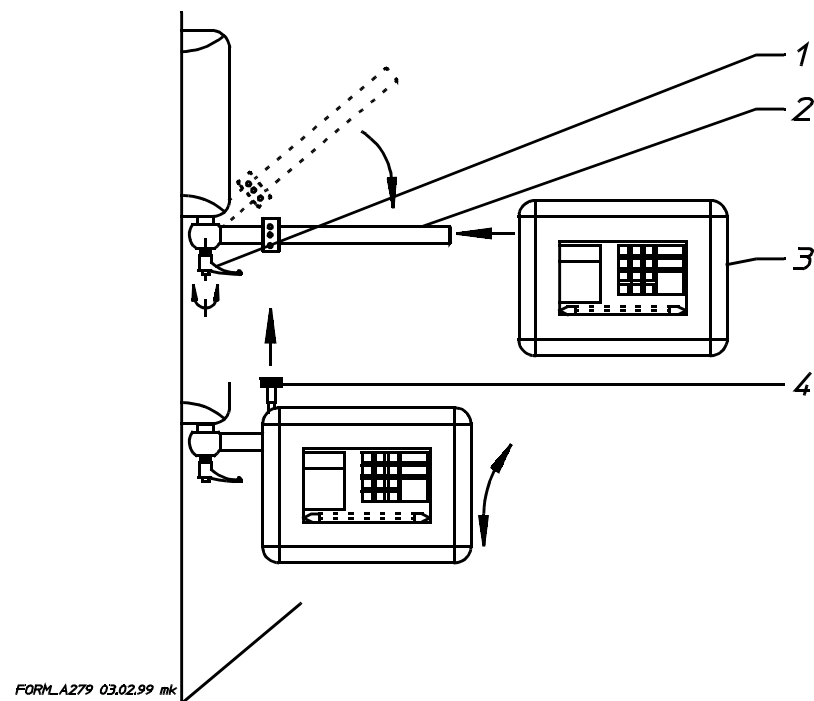


Fig. 4-13  
Control unit

- Remove the control unit (3) from the carton and unpack it
- Release the clamping lever (1)
- Turn swivel arm (2) into desired position
- Secure with clamping lever (1)
- Attach the control unit (3) to the swivel arm (2)
- Adjust the desired inclination with notch bolt (4)
- Insert the connecting cable in the socket on the connector panel

## 4.9 Precommissioning checks

Verify these preparatory steps:

- Does the place of installation meet the requirements?  
→ *4.1 Preparing the place of installation (page 21)*
- Does the wall distance comply with the specifications?  
→ *Safety clearance from wall (page 7)*
- Is the test system truly horizontal?  
→ *4.3 Installing the test system (page 29)*
- Are the wheel brakes<sup>1)</sup> applied?
- Are the supply connections set up correctly?  
→ *4.5 Setting up the supply connections (page 32)*
- Are the hose connections secured with hose clamps?
- Does the humidification water comply with our specifications  
→ *3 Technical Data (page 15) ?*
- Has the transport securing device been detached?  
→ *4.6 Transport securing device (page 33)*
- Does the electrical supply comply with our specifications?  
→ *3.3 Operating data (page 16)*
- Has the control unit »Touchpanel« been installed?  
→ *4.8 Fitting the control unit »Touchpanel« (page 36)*

1) option  
2) not assigned  
3) only for test systems with 600 ltr and more

## 5 PUTTING INTO OPERATION

### 5.1 Adding humidification water

You can fill the reservoir either by hand or connect it to a demineralized-water network

**Humidification water**

#### 5.1.1 Automatic water replenishment from a network



**WARNING**

*If you are using demineralization cartridges with ion exchanger resins, please remember to replace exhausted cartridges (i.e. conductivity meter reading  $>20 \mu\text{S/cm}$ ) without delay. Failure to do so may result in acidification of the humidification water, which has the potential of damaging the test specimens and the test system.*

**Automatic water replenishment**

- Open the front flap
- Connect pressure-proof hose
- Open the on-site water supply
- Watch the level indicator during the filling process



**WARNING**

*The water level is controlled by a float valve. If the float valve becomes leaky, the water will escape via the overflow/condensate drain. Be sure to shut the on-site water supply at the end of operation.*

### 5.1.2 Filling by hand

#### Filling by hand

- Open the front flap
- Pull the sliding cover (1) forward.
- Pour demineralized water into the feed opening, using e.g. a watering can (2).

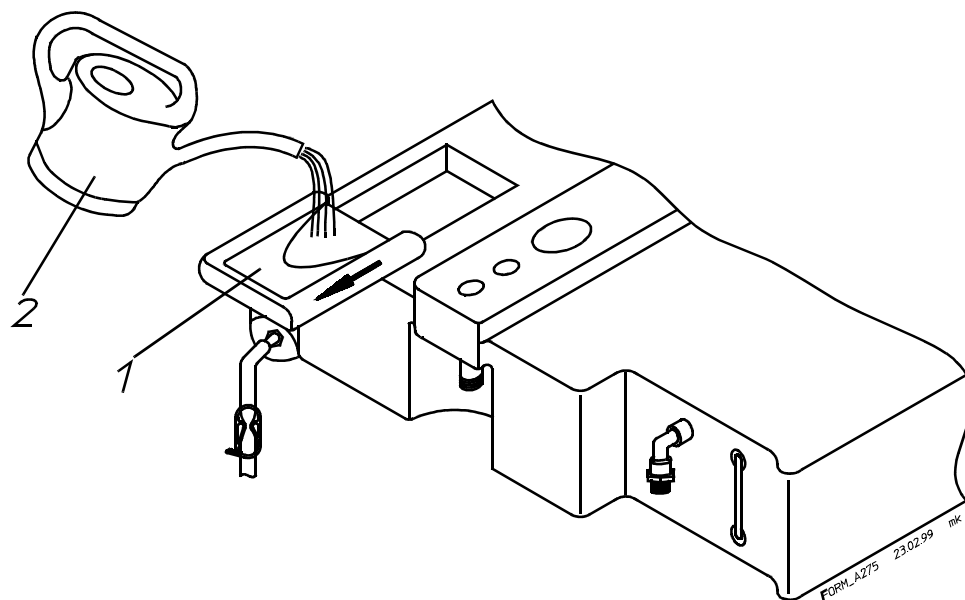


Fig. 5-1  
Reservoir with sliding cover open



#### NOTE

The reservoir holds approx. 20 litres,  
standard water consumption is approx. 2 ltr/24 h

The warning signal for water shortage occurs in two steps:

- On reaching the minimum water level, a warning signal indicates that the reservoir needs replenishing
- Another warning signal, i.e. »Reservoir humidity system empty« is emitted when the reservoir is empty. The climatic system is switched off. The test system continues with the set temperature values.



## 5.2 Preparing the humidity sensor

If the test system is equipped with a psychrometric humidity measuring system, the humidity sensor is located at the front, under the perforated insert floor.

### Humidity sensor

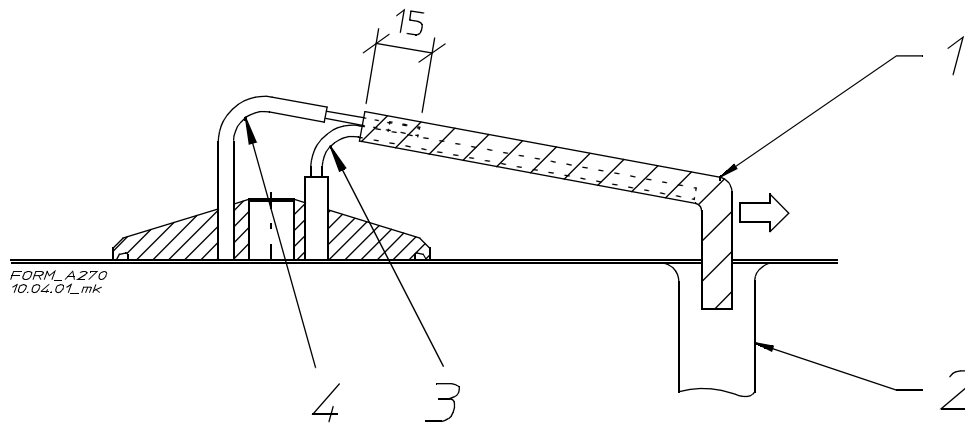


Fig. 5-2  
Humidity sensor

- 1 Humidification sleeve
- 2 Drain tube
- 3 Humidity sensor
- 4 Water feed tube

The humidification sleeve is continuously wetted by a pump.  
→ 8.4.9 Replacing the humidification sleeve (page 68)

### 5.3 Reusable condensation water

#### Condensation water

Normal reservoir setting enables the condensation water to discharge via the overflow and condensate drain.

If the test specimens used are free from harmful substances, you may set the reservoir to water return, so that condensation water will flow back into the reservoir.

Procedure:

- Remove both plugs (2) from the cover (1) (only on test systems up to 340 ltr)
- Undo sealing plug (3) in opening (4), using a screwdriver
- Insert sealing plug (3) into front opening (5)
- Push plugs (2) back into cover (1) (only on test systems up to 340 ltr)



#### WARNING

- Please note → 5.4.2 Corrosion caused by the test specimen (page 43)

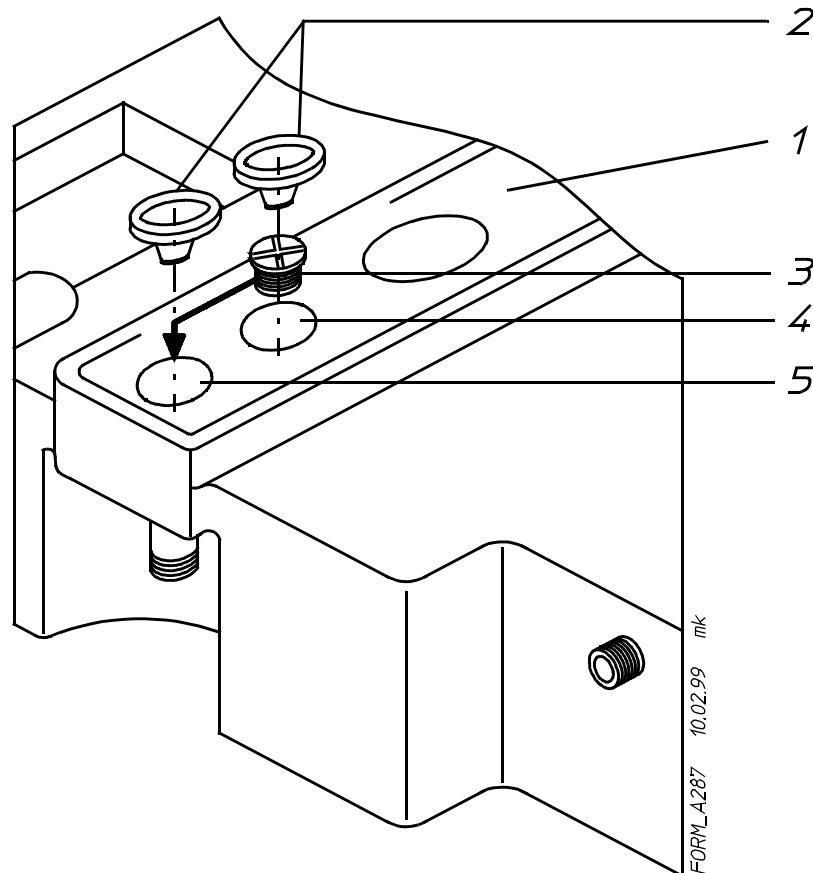


Fig. 5-3  
Reservoir change-over

## 5.4 Preparing the test specimens

### 5.4.1 Requirements

You may place the test specimens either on the test space floor or the supplied insert shelf. Ensure that they are distributed evenly over the entire surface.

- Ensure that the test specimens are suitable with regard to
  - Quality
  - Corrosive effect
  - Weight
  - Heat influence

For details → 1.5 Normal use and application (page 4)

#### Arranging the test specimens



#### DANGER

*Specimens with the following characteristics must not be placed in the test space:*

- Easily inflammable
- Explosive
- Toxic
- Corrosive

#### Characteristics

### 5.4.2 Corrosion caused by the test specimen

In conjunction with high temperature and humidity levels some test specimens will set harmful substances free and corrode the chromium-nickel steels in the test space. Regular cleaning of the test space prevents such damage.

Corrosion is mainly caused by:

- Compounds of chlorines
- Acids
- Alkaline solutions

#### Corrosion

#### Corroding agents



#### WARNING

*Unwashed, mounted PCBs and some plastics set chlorides free. Please do talk to us about suitable precautions before using such test specimens.*

### 5.4.3 Weight of test specimen

#### Weight of test specimen

The permissible weight of the test specimen depends on the size of the test system. → 3.2 *Mechanical loads* (page 15)

### 5.4.4 Heat-emitting test specimens

#### Heat-emitting test specimens

Temperature tests involving heat-emitting test specimens may be performed. The permissible heat emission depends on the size of the test system and the test space temperature. For permissible values → 3.5 *Characteristics for temperature tests* (page 17)



#### WARNING

*The test system switches off automatically in case of faults, thus disabling the cooling system. Heat-emitting test specimens would heat up the test space to inadmissible levels. It is therefore necessary to ensure that heat emission from the test specimen is interrupted when the test system is switched off. This may be triggered for example by the appropriately converted potential-free contact.*

## 5.5 Adjusting the test specimen protection

### 5.5.1 Software temperature limiter

#### Software temperature limiter

The controller has a software temperature limiter for setting alarm and warning limits for permissible minimum and maximum temperature values.

If no limits are set, the test system will automatically use the limit values of the previous test.

Set the limits in accordance with the separate »Touchpanel« manual, »Setting the limits«.



#### NOTE

*On starting a test, ensure that the lower limit to be set is below the actual test space temperature and the upper limit above the actual test space temperature.*

*The permissible limits must be at least 5 K higher / lower than the respective setpoints of the test system.*

*The exact upper and lower limits depend on the temperature sensitivity of the test specimen.*

### 5.5.2 Test specimen protection by adjustable temperature limiter

To protect the test specimen against thermal overstressing, the test system is equipped with a temperature limiter which operates independently of the controller. A mobile sensor can be conveniently positioned in the test space. On exceeding or falling short of the set maximum / minimum limits, the test system is switched off permanently by the controller. The control unit displays a fault message. Simultaneously, the respective indicator light (»MIN« / »MAX«) on the temperature limiter lights up.

The temperature limiter is located on the main switch panel, the respective measuring sensor on the rear panel in the test space.

#### Adjustable temperature limiter



#### NOTE

*The limit for the maximum value must be approx. 5 to 10 K above, the limit for the minimum value approx. 5 to 10 K below the temperature setpoint.*

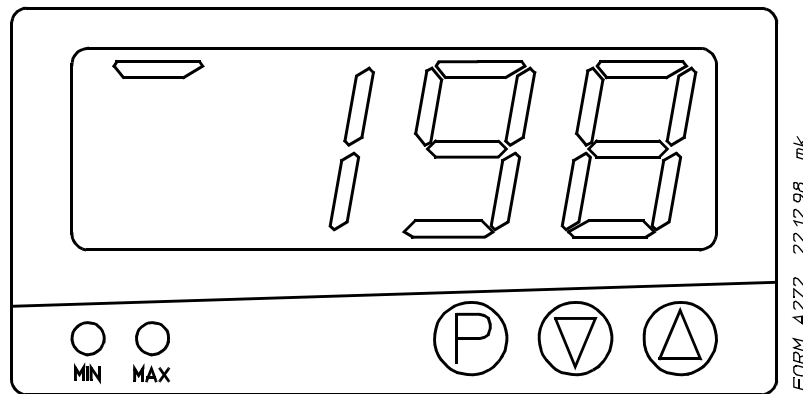


Fig. 5-4  
Temperature limiter

#### Temperature limiter

The limits are factory-set in accordance with the temperature range of the test system.

- You can adapt these values to your requirements as follows:

Input the maximum temperature value as follows:

Use      to select display »AH«

$\textcircled{P} + \textcircled{\Delta} >3\text{s}$	»AH« (alarm limit high) and actual maximum temperature value are displayed alternately
$\textcircled{\Delta}$ or $\textcircled{\nabla}$	Select the desired temperature value
$2 \times \textcircled{P}$	Save the temperature value, return to basic setting

Table 5-1

Input the minimum temperature value as follows:

Use  $\textcircled{P}$  to select display »AH«

$\textcircled{P} + \textcircled{\nabla} >3\text{s}$	»AL« (alarm limit low) and actual minimum temperature value are displayed alternately
$\textcircled{\Delta}$ or $\textcircled{\nabla}$	Select the desired temperature value
$2 \times \textcircled{P}$	Save the temperature value, return to basic setting

Table 5-2



NOTE

Depress the combinations  $\textcircled{P} + \textcircled{\Delta}$  or  $\textcircled{P} + \textcircled{\nabla}$  simultaneously for more than 3 seconds while »AH« is being displayed, otherwise the temperature value cannot be changed. In this case use  $\textcircled{P}$  again to select display »AH«. If the changed temperature value is not saved with  $2 \times \textcircled{P}$ , the test system will return to the previously set temperature value after 30 seconds.

Malfunctions will cause the respective indicator light on the temperature limiter to light up. In addition, a fault message will be displayed on the control unit.

To eliminate the fault, proceed as follows:

- Increase the »AH« value or reduce the »AL« value by approx. 10 K. Alternatively, open the test space door until the temperature in the test space is back within the limit range.
- Save the new temperature value with  $2 \times \textcircled{P}$
- Keep  $\textcircled{P}$  pressed for approx. 3 seconds, the indicator light goes off
- Acknowledge the fault message on the control unit as follows:
  - Mark the fault message with arrow
  - Press »QUIT« to eliminate the fault message  
→ operating manual for control unit »Touchpanel«, chap. 8.2

If the test space temperature is still outside the limit range, the fault signal will occur again. By pressing  $\textcircled{P}$ , the actual value can be interrogated on the temperature limiter via function »INP«.

In case no test specimen protection is required, the measuring sensor may be placed in the mounting at the rear panel.

Betriebsanleitung für Klimaprüfschränke  
Kap5.fm 63837023 GB 03.2003

## 5.6 Sealing the entry ports

- Close the entry ports with the sealing plugs supplied



### NOTE

*Open entry ports cause high water consumption during climatic tests. As a result, tests with extreme humidity values are not feasible, and low test space temperatures may cause icing of the evaporator.*

## 5.7 Switching on the test system

Set the main switch to position »I«

## 5.8 Test space illumination<sup>1)</sup>

A test space illumination is provided, which should only be used when actually needed.

It is activated by pressing button  on the control unit.

### Illumination



### NOTE

*The light is switched off automatically by the controller after approx. 10 minutes.*

## 5.9 Starting a test

Tests are started on the control unit. Two modes are available:

- Manual mode
- Automatic mode
- For further details → operating manual for control unit »Touchpanel«

## 5.10 Temperature tests in manual mode

→ operating manual for control unit »Touchpanel«, chap. 4

Proceed as follows:

- Input the temperature setpoint on the control unit
- Start up the test system

5.11 Climatic tests in manual mode

→ operating manual for control unit »Touchpanel«, chap. 4

Proceed as follows:

- Input the temperature setpoint on the control unit
- Input the humidity setpoint on the control unit
- Activate digital channel »Humidity«
- Start up the test system

5.12 Stored standard programs

Fixed standard programs are available for automatic mode.

Temperature programs

Program location	Test standard	Identical with test standard	Example
101	IEC 60068-2-1, Test A	DIN 40046 Part 3 BS 2011 Part 3 MIL STD 810 Meth. 502.2	t = -25 °C, 96 h
102	IEC 60068-2-2, Test B	DIN 40046 Part 4 BS 2011 Part 2 MIL STD 810 Meth. 501.1	t = +125 °C, 96 h
103	IEC 60068-2-14, TEST Nb	MIL STD 331 Part 112 DIN 40046 Part 14	t <sub>0</sub> = +125 °C, t <sub>U</sub> = -25 °C 1 K/min, t <sub>0</sub> , t <sub>U</sub> : 2 h

Table 5-3  
 Standard programs

Temperature / Humidity programs

Program location	Test standard	Identical with test standard	Example
104	IEC 60068-2-78, Test Cab	DIN 40046, Part 5 MIL STD 202 Meth. 103.B	t = +40 °C, U= 93%, 21 d
105	IEC 60068-2-78, Test Cab	DIN 40046 Part 4 BS 2011, Part 2 MIL STD 810	t = +30 °C, U= 93%, 21 d
106	IEC 60068-2-66, Test Cx	MIL STD 331 Part 112 DIN 40046 Part 14	t = +85 °C, U= 85%, 168 h

Table 5-4  
 Additional standard programs

Betriebsanleitung für Klimaprüfschränke  
 Kap5.fm 63837023 GB 03.2003

1) option  
 2) not assigned  
 3) only for test systems with 600 ltr and more



## 5.13 Preoperational check list

Verify these preparatory steps:

- Has humidification water been added / has the automatic water replenishment been set up?
- Has the humidification sleeve been prepared correctly?  
→ *Fig. 8-4 Humidity sensor (page 68)*
- Is the test specimen suitable for the planned test?  
→ *5.4 Preparing the test specimens (page 43)*
- Check test specimen for maximum permissible weight  
→ *3.2 Mechanical loads (page 15)*
- Disconnection of heat-emitting test specimens by the potential-free contact must be ensured  
→ *5.4.4 Heat-emitting test specimens (page 44)*
- Check settings on software temperature limiter → *5.5.1 Software temperature limiter (page 44)*
- Check settings on adjustable temperature limiter → *5.5.2 Test specimen protection by adjustable temperature limiter (page 45)*
- Are the entry ports sealed? → *1.6.5 Safety instructions (page 7), »Entry ports«.*
- Maintenance work to be expected during the scheduled test period should be carried out beforehand → *8.3 Maintenance schedule (page 60)*
- Have all options been installed correctly?



## 6 PUTTING OUT OF OPERATION

Please observe the following differentiations:

### 6.1 After each test

After termination of a test, and before removing the test specimen from the test space, ensure that the inside of the test system has assumed room temperature.

**After each test**



#### **DANGER**

*The test space, the inside of the door, the air in the test space as well as the test specimen may still be hot or extremely cold.*

- Avoid contact with hot or extremely cold parts

Proceed as follows:

- Input 25 °C on the control unit  
(→ operating manual for control unit »Touchpanel« )
- Set the test system to room temperature
- Press »STOP« to switch the test system off
- Put external systems out of operation
- Put optional equipment out of operation
- Open the test space door - be sure to avert your face from the test space air
- Remove the test specimen from the test space - be sure to wear protective gloves
- Clean and dry the test space

## 6.2 Longer rest periods

### Longer rest periods

If a longer rest period is expected, or if the test system is moved to a place with room temperatures below zero, the following points, in addition to those indicated in chapter 6.1 *After each test (page 51)*, must be observed:

- Set the mains switch to position »0«
- Pull the mains plug
- Open the front flap
- Empty the water reservoir  
→ 8.4.8 *Cleaning the water reservoir (page 67)*
- Open the left cover sheet
- Open the hose clip (1) to drain residual water

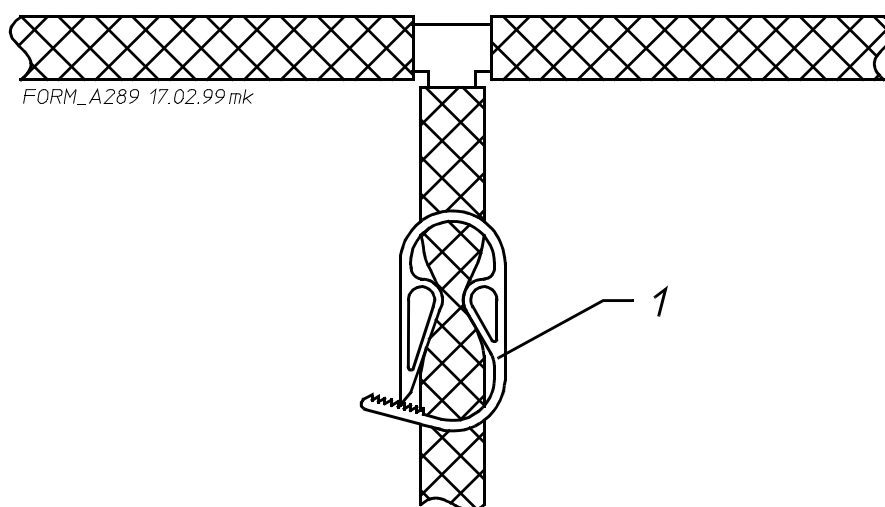


Fig. 6-1  
Hose clip

- Reassemble in reverse order

### 6.3 Final disposal of the test system

In the event the test system is no longer needed, or replaced by a new one, please ensure it is disposed of professionally.



#### DANGER

*The following materials represent hazardous waste and must be disposed of separately:*

- Refrigerants
- Compressor oil
- Electrical components

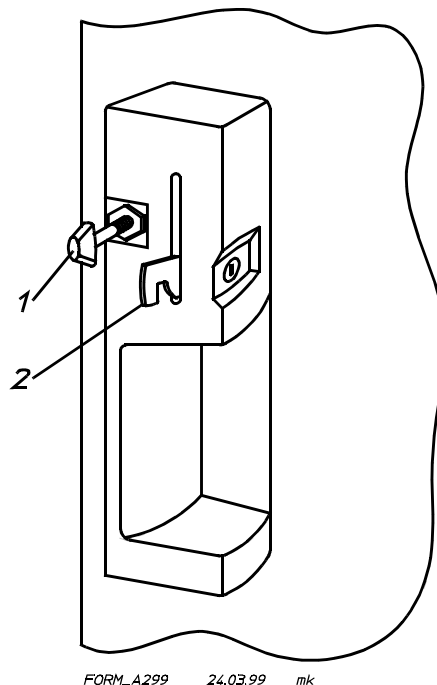
If desired, our service organisation can take care of the disposal, at customer's expense. Please get in touch with us so that we can arrange for a professional and environmentally acceptable way of disposal.

If you decide to dispose of the test system yourselves, please take the following precautions:

- Destroy the door lock to prevent persons from being trapped.  
To destroy the lock, proceed as follows:
  - Undo the locking wedge (1) anticlockwise with suitable tool and take it out
  - Lock the catch (2) while the door is open, and take out the key.
- Ensure that materials like refrigerants, compressor oil and electrical components are handled as special waste.

With regard to the specified materials and the disposal of the remaining components, the national and local waste disposal regulations, valid at the time of disposal, must be observed.

#### Special waste



FORM\_A299 24.03.99 mk

Fig. 6-2  
Locking wedge



## 7 FAULT DIAGNOSIS AND RECTIFICATION

Depending on the kind of fault signal, the rectification can be performed by:

- The user
- A skilled person
- Our service organisation

### 7.1 General malfunctions

No.	Fault	Possible cause	Rectification
	Temperature and humidity setpoints cannot be achieved	Lack of refrigerant in the refrigerating unit	Contact our service organisation
	Actual humidity value deviates from setpoint	1 Humidification sleeve soiled	Replace the humidification sleeve (this may be performed by the user)
		2 Continuous wetting of humidification sleeve not working	Activate humidity afresh. Check water feed to humidification sleeve. Feeding failure means that pump is defective. Contact our service organisation.
		3 Water in the reservoir, but no water in the humidification tray	Lift the insert floor in the test space to check water level in the humidification tray. Lack of water means pump is defective. Contact our service organisation.

Table 7-1  
Faults

## 7.2 Fault messages

### Fault messages

Malfunctions which occur during operation are signalled by a red LED and a flashing error message on the control unit.

If a fault occurs proceed as follows:

- Rectify the fault in accordance with the following fault table
- Acknowledge the error message in accordance with the »Touchpanel« operating manual
- Resume operation


Code No.	Message	Possible cause	Rectification
1	Actual value defective:EKO/X21	Temperature sensor defective	Switch off the test system Contact our service organisation
2	Actual value defective:EK1/X22	Sensor defective	Switch off the test system Contact our service organisation
3	Actual value defective:EK2/X23	Sensor defective	Switch off the test system Contact our service organisation
12	Change back-up battery	Controller battery exhausted	Switch off the test system Contact our service organisation
13	Communication Touchpanel	Connection control unit - controller is interrupted	Check connectors
14	Communication I/O system	Connection controller - I/O system is interrupted	Switch off the test system Contact our service organisation
15	Chambertype invalid	Wrong test system parameters	Switch off the test system Contact our service organisation
16	Power fail	Power failure or tolerance band outside defined range	Check power failure and tolerance band values. Restart the test system.
17	Service	Overload or short circuit of motor protecting switch	 <b>DANGER</b> This fault can cause contact welding of the associated load contactor thus rendering the safety device ineffective. Switch off the test system and notify our service organisation.
18	Thermal protection fan	Thermal protection of test space fan triggered	Switch off the test system. Check motor for smooth running and impurities. Check cooling air supply. If necessary, clean and remove impurities.

Table 7-2  
Fault messages



Code No.	Message	Possible cause	Rectification
19	Temp. limiter testchamber	Thermal safety device in the test space triggered	Switch off the test system Contact our service organisation
20	Thermal specimen protection	1. Limits of test specimen protection exceeded	Press „P“ or „RESET“ on the adjustable temperature limiter to clear fault. Check limit setting and programmed setpoint. Switching point hysteresis is 2 K
	Display of temperature limiter is flashing and reads 1999	2. Sensor of temperature limiter is broken or short-circuited	Switch off the test system Contact our service organisation
21	Software specimen protection	Actual temperature value is outside the test chamber configuration	Check input and adjust setpoint to temperature range → 3 <i>Technical Data (page 15)</i>
33	Thermal prot. compr. precooling	Thermal protection of precooling compressor triggered	Contact our service organisation
34	High pressure compr. precooling	Excess pressure in the refrigerating unit	Switch off the system. Clean condenser. On water-cooled <sup>1)</sup> systems check water inlet, clean dirt filter, check water pressure and water inlet temperature.
35	Oilpressure compr. precooling	Oil pressure of precooling compressor is too low	Contact our service organisation
36	Low pressure compressor PC	Low pressure in the refrigerating unit	Switch off the system. Contact our service organisation.
37	Thermal prot. compr.-fan	Thermal protection of compressor fan triggered	Contact our service organisation
38	Thermal prot. condenser-fan	Thermal protection of condenser fan triggered	Contact our service organisation
39	Press.-gastemp. compr. precool.	Pressure gas temperature of compressor is too high	Contact our service organisation
40	Cond.-press.- measurement faulty	Pressure measuring system defective	Contact our service organisation
49	Humidity out of range	Actual humidity value is outside the test chamber configuration	Check input and adjust setpoint to permissible humidity range → 3 <i>Technical Data (page 15)</i>
50	Temp. limiter humidity system	Thermostat in humidification pan triggered	Lift test space insert floor to check water level in the humidification pan. No water means the pump is defective. Contact our service organisation.
51	Humidity-calculator not OK	Psychrometer water supply interrupted	Check correct position of humidification sleeve and pump water supply

Table 7-2  
Fault messages

Code No.	Message	Possible cause	Rectification
52	Setpoint out of meas.-range	Dewpoint setpoint < -12 °C although no capacitive humidity measuring system is installed	Set higher dewpoints
54	Refill demin. water	The humidification water supply is running short	Replenish reservoir. Test system continues operating.
55	Reservoir humidity system empty	No water in humidity system or pump not working	Fill reservoir with water. If pump is defective, contact our service organisation.
57	Open door	Test space door open	Close the test space door
60	Humidity setpoint out of range	Humidity setpoint outside test system configuration. The test system adjusts automatically to suitable limit value.	Adjust setpoint to permissible humidity range → 3.6 <i>Characteristics for climatic tests (page 18)</i>
61	Temp.limiter humidity system	Limits of test specimen protection exceeded	Check limit setting

Table 7-2  
Fault messages

- Contact our service organisation if a fault cannot be rectified with the aforementioned measures, or if a fault occurs repeatedly.

Service agencies

For service agencies → *Appendix*

Data required for fault report



**NOTE**  
*To ensure speedy service, please quote the following particulars when reporting a fault:*

- Type of system / order no.
- ID no.
- Fault message on the control unit

Data on rating plate

You will find this data on the rating plate over the main switch and on the reverse of the front cover of this manual.

## 8 MAINTENANCE

### 8.1 General information

Regular care and maintenance are essential for optimum operation and long service life of the test system.

The maintenance schedule → *8.3 Maintenance schedule (page 60)* contains some basic maintenance work which may be performed on site, by trained personnel only. It does, however, not replace the expert maintenance offered by our service organisation.

The inspection intervals for refrigerating unit, electrical equipment and safety devices are specified in a maintenance contract with our service organisation. For the address → *Appendix*.

**Maintenance contract**



#### NOTE

*Annual inspection of pressure monitoring safety devices is necessary according to EN 378-2, Appendix C.6 Safety Requirements. The inspection should only be performed by our service, or a skilled person authorized by us.*



#### DANGER

*Maintenance work on refrigerating unit and electrical equipment must be performed by a skilled person.*

- Contact our service organisation

We will either charge a qualified maintenance specialist to perform the servicing, or name you authorized experts.

Our service organisation has the technical facilities required for expert disposal of the waste material resulting from servicing. If desired, our service organisation will take back the material to be disposed of, at customer's expense.

**Disposal of waste resulting from servicing**

## 8.2 Consumables

### Consumables

The following consumables are used for maintenance:

Ordering code	Designation
64444158	Humidification sleeve, length 10 m
63992001	Halogen bulb 24 V / 50 W <sup>1)</sup>
63640241	Cartridge for demineralization unit <sup>1)</sup>

Table 8-1  
Consumables

- Consumables may be ordered from our service organisation.

## 8.3 Maintenance schedule

Interval	Assembly group / component	Activity	Follow directions in chapter
After each test	Test space	Clean	→ 8.4.1 (page 62)
	Test space seal	Clean	→ 8.4.2 (page 63)
Monthly	Water reservoir	Clean	→ 8.4.8 (page 67)
	Humidification water	Replace	→ 8.4.7 (page 66)
	Humidification sleeve	Replace	→ 8.4.9 (page 68)
Quarterly	Fins on air-cooled condenser	Clean	→ 8.4.4 (page 64)
	Filter of switchgear cabinet fan	Clean	→ 8.4.5 (page 65)
Yearly	Capacitive humidity system <sup>1)</sup>	Calibrate	→ 8.4.10 (page 68)
As necessary	Halogen bulb <sup>1)</sup>	Replace	→ 8.4.6 (page 66)
	Demineralization cartridge <sup>1)</sup>	Replace	→ separate operating instructions

Table 8-2  
Maintenance schedule

## 8.4 Maintenance work

**DANGER**

*Prior to performing maintenance work, guard the test system against accidental switching on and observe the safety instructions in chapter → 1.6.5 (page 7), »Maintenance work«.*

**WARNING**

*When servicing the switchgear cabinet or mechanical section, ensure there is a sufficiently large clearance around the test system - even with open doors - to serve as escape route. If the clearance is too small, move the test system from the wall by means of a fork stacker → 1.6.5 (page 7) »Safety clearance from wall«.*

**WARNING**

*Do not use sharp tools when servicing the test space or climatic system*

**No sharp tools**

**DANGER**

- Wear protective gloves

### 8.4.1 Cleaning the test space

#### Preventing corrosion

To prevent corrosion, the following surfaces must be cleaned after each test:

- The inner walls
- The insert floor
- The humidification pan
- Use clear water and a regular detergent



#### DANGER

*The humidification pan contains components which may cause hand injuries*

- Wear protective gloves
- Be careful not to damage the measuring sensors at the front

If corrosive deposits have formed, use a regular stainless steel cleanser. Be sure to remove all cleanser residue afterwards. If corrosive spots cannot be eliminated this way, polish with stainless steel cleaning wool only.

The insert floor can be removed for cleaning purposes.

- Raise the insert floor (1) as indicated by the arrows  
→ *Fig. 8-1 Insert floor (page 63)*
- Take it out of the test space
- Remove impurities with a brush
- Rinse test space and humidification pan with water
- Dry the test space

**NOTE**

The dirty water from the test space is drained via the overflow and condensate drain → Fig. 4-10 Supply connections on reservoir (page 31)

**Removing the insert floor**

The dirty water from the humidification pan can be drained by opening the hose clip → Fig. 6-1 Hose clip (page 52).

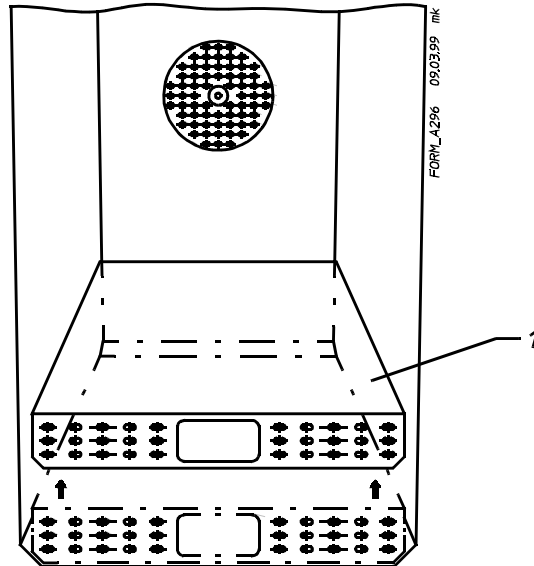


Fig. 8-1  
Insert floor

#### 8.4.2 Cleaning the test space seal

To prevent the test space seal from sticking to the test space door, or freezing up, it must be cleaned with clear water and subsequently dried after each test. You may use a regular detergent.

**Test space seal**

### 8.4.3 Checking the test space tightness

The test space must be sealed up tightly.

Check the tightness as follows:

- Place a paper strip between test space door and seal
- Pull it out - there must be a noticeable resistance
- Repeat this procedure all around the door

If the sealing is not tight, contact our service organisation.

### 8.4.4 Cleaning the air-cooled condenser

The air-cooled condenser is located in the mechanical section

→ Fig. 2-1 Test system (page 11)

#### Cleaning the fins



#### DANGER

*The fins of the condenser may cause hand injuries*

- Be sure to wear protective gloves

Dust deposits on the fins of the air-cooled condenser will cause non-permissible pressure increase in the refrigerating unit.

- Open the front flap
- Check the air-cooled condenser regularly for dust deposits
- Clean it every three months, more often in dusty environments.
- Use a vacuum cleaner, compressed air or a brush



### 8.4.5 Cleaning the filters of the switchgear cabinet fan

The controller and electrical components in the switchgear cabinet are cooled by a fan. Dust filters are installed in the air inlet and outlet of the switchgear cabinet.

- Clean the filters every three months, more often in dusty environments.

#### Cleaning the filters

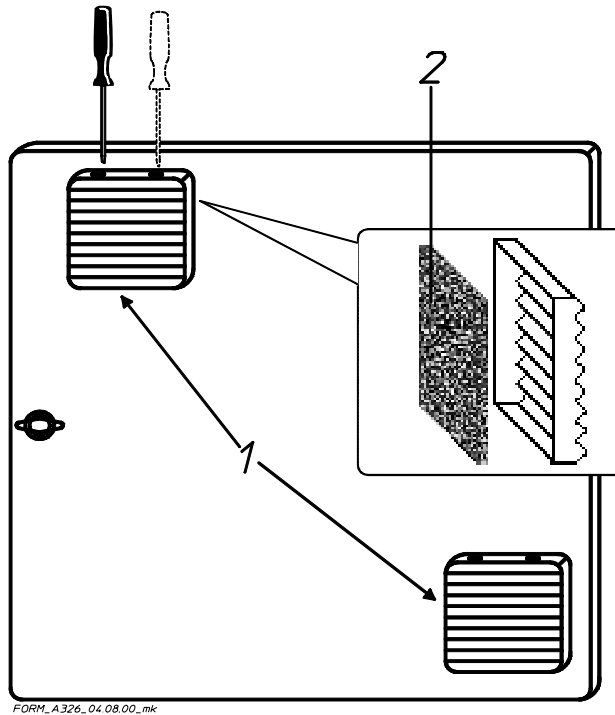


Fig. 8-2  
Dismantling the fan filter

- Open the cover of the mechanical section at the rear of the test system → Fig. 2-1 Test system (page 11)
- Remove the guard (1) of the filters (2)
- Reassemble in reverse order

#### Dismantling the filters

The following methods may be employed for cleaning the filters (2):

- Rinsing with water
- Beating
- Vacuum-cleaning
- Blowing out with compressed air

#### Cleaning the filters

## Replacing the halogen bulb<sup>1)</sup>

### 8.4.6 Replacing the halogen bulb<sup>1)</sup>

The light is located behind the left section of the test space ceiling. To access the halogen bulb, remove the test space ceiling. .

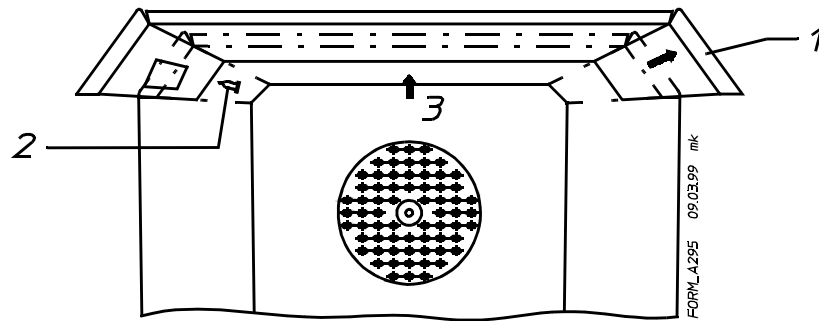


Fig. 8-3  
Test space illumination<sup>1)</sup>

- Push the test space ceiling (1) upward, as indicated by arrow (3), (push near the rear wall)
- Slide it forward on the moulded guides
- Pull out the defective bulb (2)
- Take the new bulb in a clean cloth and insert it
- Reassemble in reverse order

## Replenishing the humidification water

### 8.4.7 Replenishing the humidification water

Prior to starting a new test, check the water level in the reservoir. Top up via the feed opening, if necessary. No topping up is required if a demineralization unit<sup>1)</sup> or automatic water replenishment is installed.



#### WARNING

*Only use distilled or demineralized water  
→ 3.6 Characteristics for climatic tests (page 18).  
If the water is contaminated, the reservoir must be cleaned and filled with fresh water.*

### 8.4.8 Cleaning the water reservoir

**WARNING**

Be careful not to damage the float switches which are located in the left rear section of the reservoir.

Clean the reservoir as follows:

- Shut off the automatic water replenishment
- Place a receptacle under the reservoir drain (2)  
→ 4.4.1 *Supply connections* (page 31)
- Open the hose clip to drain the reservoir
- Empty the reservoir
- Pull the sliding cover (1) forward
- Clean the reservoir carefully through the feed opening, using a brush.
- Rinse the reservoir with water
- Squeeze the hose clip

**Cleaning the reservoir**

### 8.4.9 Replacing the humidification sleeve

#### Replacing the humidification sleeve

Soiled or damaged humidification sleeves must be replaced.

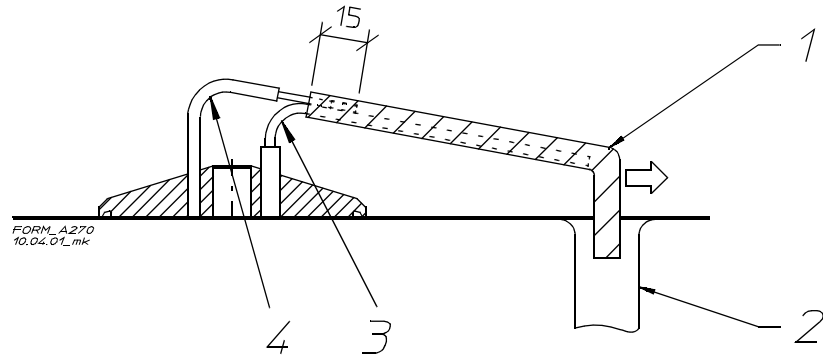


Fig. 8-4  
Humidity sensor

- Remove the used humidification sleeve (1) by pulling it toward the right
- Cut the new humidification sleeve to a length of approx. 100 mm
- Slip it over the humidity sensor (3) until it covers approx. 15 mm of the water feed tube (4)
- Ensure that the humidification sleeve reaches into the drain tube (2) as illustrated above

### 8.4.10 Calibrating the capacitive humidity measuring system<sup>1)</sup>

#### Calibrating the humidity measuring system<sup>1)</sup>

With regard to the added humidity control with capacitive humidity measuring system<sup>1)</sup>, please bear in mind that the displayed humidity values may differ from the actual ones, depending on the test conditions (high temperature and humidity values) and operating hours of the test system.

Gas emissions from the test specimens may affect the humidity measuring system, thus causing deviations.

We recommend yearly calibration of the humidity values by our service organisation.

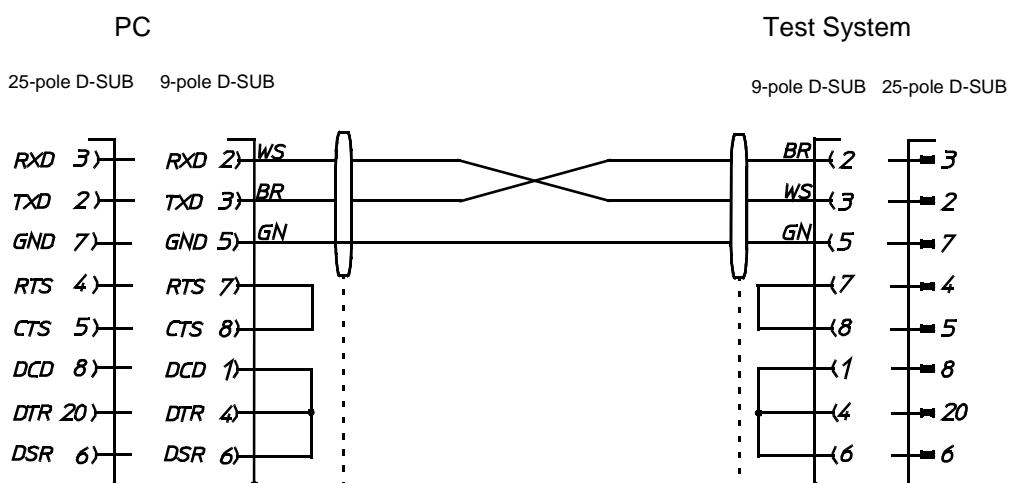
## APPENDIX: INTERFACE CONNECTIONS

### 1.1 Interface RS 232

Connectors may only be plugged when the test system is switched off.

The RS 232 interface is used for e.g. external control via computer. Depending on the pole number of the connectors, the pin assignment is as follows:

#### Interface 232



→ 2.2.8 Main switch panel (page 13)

Suitable connecting cables and adaptors are available as an option.



#### NOTE

*If the connecting cable is produced by yourselves, be sure that both ends of the shield are fixed to the metallic enclosure.*

Interface RS 485 / RS 422

1.2 Interface RS 485 / RS 422<sup>1)</sup>

1.2.1 Introduction

This appendix contains installation instructions for the Interface RS 485 / RS 422.

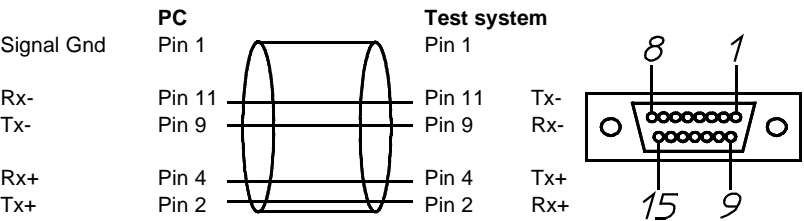
1.2.2 Description

The network RS 485/RS 422<sup>1)</sup> interfaces in connection with the mini-Combox 2 are used for networking several test systems.

The connectors are located on the main switch panel  
→ 2.2.8 Main switch panel (page 13).

1.2.3 Technical data

The 15-pole D-subminiature connectors are assigned as follows:



NOTE

The pin assignment to PC is only valid in connection with interface converter RS 232 / RS 485<sup>1)</sup>, ordering code 63823080. Interfaces RS 232 and RS 485/422<sup>1)</sup> cannot be used simultaneously.

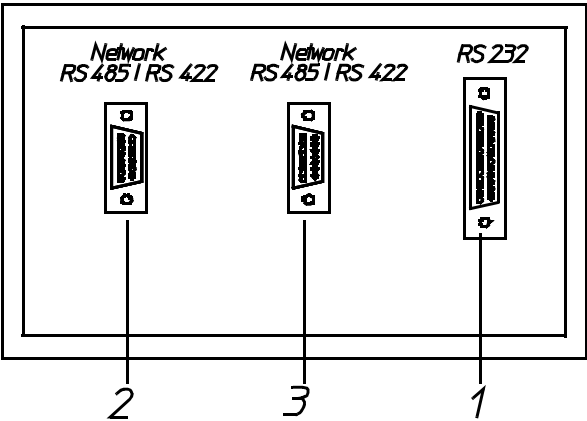


Fig. 1-1  
Connector panel

- 1 Interface RS 232
- 2 Interface RS 485 / RS 422<sup>1)</sup>
- 3 Interface RS 485 / RS 422<sup>1)</sup>

1) option  
2) not assigned  
3) only for test systems with 600 ltr and more

### 1.3 Temperature and humidity measuring sensor<sup>1)</sup>

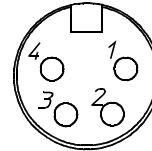
The plug connection (socket 5) → 2.2.8 *Main switch panel (page 13)* is used for the independent capacitive humidity measuring sensor<sup>1)</sup> and the Pt 100 temperature measuring sensor<sup>1)</sup>.

#### Temperature and humidity sensor<sup>1)</sup>

The 4-pole plug supplied must be connected on site and inserted in the connector panel.

The 4-pole socket is assigned as follows:

- actual temperature and humidity	Pin 1
+ Pt 100 1 actual temperature	Pin 2
+ actual humidity	Pin 3
Shield	Pin 4



Output of temperature values:

0 to 10 V equivalent to -100 °C to +200 °C

Output of humidity values: 0 to 10 V equivalent to 0 % to 100 %

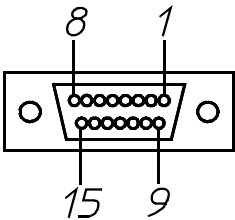
1.4 Analog I/O<sup>1)</sup>

Analog I/O<sup>1)</sup>

The Analog I/O<sup>1)</sup> connection is used for external acquisition of actual temperature and humidity values.  
Outputs 0 - 10 V = -100 °C to +200 °C or 0 to 100 % r.h.  
Max. insulation voltage to ground is 1 kV-DC.

The 15-pole D-subminiature connector is assigned as follows:

- |                      |        |
|----------------------|--------|
| - actual temperature | Pin 1  |
| + actual temperature | Pin 9  |
| - actual humidity    | Pin 2  |
| + actual humidity    | Pin 10 |
| - Pt 100 1           | Pin 3  |
| + Pt 100 1           | Pin 11 |
| - Pt 100 2           | Pin 4  |
| + Pt 100 2           | Pin 12 |
| - Pt 100 3           | Pin 5  |
| + Pt 100 3           | Pin 13 |

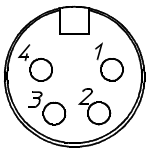
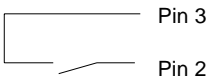


→ 2.2.8 Main switch panel (page 13)

1.5 Potential-free contact for disconnecting test specimens

Potential-free contact

The connection for the potential-free contact is taken to a socket (max. load 24 V, 0.5 A).



In case of malfunction pin 2 and 3 are open.

If the potential-free contact is used, ensure it is compatible with the on-site measuring system.

→ 2.2.8 Main switch panel (page 13)

1) option  
2) not assigned  
3) only for test systems with 600 ltr and more



## APPENDIX: DEMINERALIZATION UNIT<sup>1)</sup> TYPE B10DN

### 1.1 Introduction

This appendix contains installation and operating instructions for the demineralization unit.

### 1.2 Description

#### 1.2.1 Design

Choose a convenient place in the vicinity of the test system. Flexible hoses are used to connect the unit to the on-site water supply and test system.

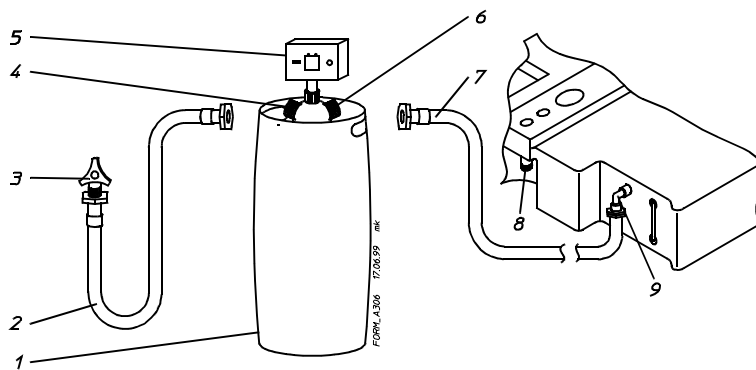


Fig. 1-1  
Demineralization unit

- 1 Cartridge
- 2 Untreated water hose
- 3 On-site water tap
- 4 Inlet connection piece
- 5 Conductivity meter
- 6 Outlet connection piece
- 7 Treated water hose
- 8 Connection overflow reservoir
- 9 Connection reservoir

#### 1.2.2 Function

The demineralization unit ensures a reliable supply of demineralized water for the humidification system.

Filling by hand is no longer necessary.

### 1.3 Technical data

#### 1.3.1 Dimensions

Type	Ø [mm]	Height incl. cond. meter [mm]	Height cartridge only [mm]
B 10 dN	210	680	550

#### 1.3.2 Connection data

Type	Max. allowable working press.	Inlet	Outlet
B 10 dN	8 bar	R 3/4"	R 3/4"

#### 1.3.3 Performance data

Type	Output based on water hardness		Max. flow ltr/h
	10° dH	20° dH	
B 10 d	1200 l	600 l	300

Exhaustion point: 20 µS/cm

#### 1.3.4 Power supply

Rated voltage: 230 V AC / 50-60 Hz

Rated current: 5 mA

Protection: IP 65

## 1.4 Preparation for initial operation

### 1.4.1 Setting up the connections

Connect the supply hoses as follows:

- Fix the straight screw connection of the untreated water hose (2) to the on-site tap (3), size R 3/4"
- Fix the elbow screw connection of the untreated water hose (2) to the inlet connection piece (4) of the demineralization cartridge (1)
- Fix the elbow screw connection of the treated water hose (7) to the outlet (6) of the demineralization cartridge
- Open the front flap beneath the test space door
- Lead the hose underneath the test system and fix the straight screw connection to connection piece (9) »Demineralized water« at the reservoir
- Screw the conductivity meter (5) to the top of the demineralization cartridge
- Lead the overflow (8) of the reservoir to a floor outlet



#### WARNING

*It is essential for safe operation to:*

- Insert the seals supplied into the hose connections
- Ensure a water pressure between 1.5 to 6 bar



#### WARNING

*Connect the demineralization unit to a cold water tap only*

- Protect the unit against freezing and heat



#### NOTE

*The local plumbing regulations and water board instructions should be observed*

- Keep the cartridge caps and apply them when returning the cartridges for regeneration

### 1.4.2 Electrical connection

- Insert the mains plug of the conductivity meter into an on-site socket-outlet

## 1.5 Putting into operation



### WARNING

*Prior to switching on, be sure to:*

- Put the test system into operation in accordance with  
→ 5 Putting into operation (page 39)
- Close the test space door

Longer rest periods and a weak flow will cause reionization, thus increasing the conductivity value. If this happens, drain water until the conductivity value drops below 20 µS/cm.

If the value fails to drop below 20 µS/cm → 1.8 Maintenance (page 6)

### 1.5.1 Venting the cartridge



### WARNING

*Ensure that each new or newly regenerated cartridge is thoroughly vented*

- Fix the untreated water hose to the outlet connection piece (on pressure-proof cartridges pull back the red ring of the rapid action coupling)
- Open the water tap until water comes out of the inlet connection piece
- Set up the connection again in accordance with  
→ 1.4.1 Setting up the connections (page 3)
- Open the water tap
- Drain water until the pointer of the conductivity meter moves into the green zone

## 1.6 Putting out of operation

Depending on the scheduled duration of the rest period, the following steps must be taken:

- Turn off the on-site water supply
- Undo the hose screw connections
- Allow the water to drain off

## 1.7 Malfunctions

### 1.7.1 Fault diagnosis and rectification

Fault	Possible cause	Rectification
Conductivity value exceeds 20 µS/cm	1.The resin in the cartridge is exhausted	Replace the cartridge → 1.8.2 <i>Changing the cartridge (page 6)</i>
	2.Reionization caused by longer rest periods or weak flow	Drain water until conductivity value drops below 20 µS/cm

## 1.8 Maintenance

### 1.8.1 General information



#### **DANGER**

*Prior to performing maintenance work on the demineralization unit, the following points must be observed:*

- Ensure the test system has assumed room temperature
- Turn the main switch to »0«
- Guard the main switch with a padlock against accidental switching on
- Pull the mains plug of the conductivity meter

### 1.8.2 Changing the cartridge



#### **WARNING**

*As soon as the conductivity limit of 20 µS/cm has been reached during operation, the cartridge should be replaced. Failure to do so may result in acidification of the humidification water. This has the potential of damaging the test specimens and the test system.*



#### **NOTE**

*It is advisable to keep a spare cartridge ready when the conductivity meter reads 10 µS/cm*

### Changing cartridges

To change the cartridge proceed as follows:

- Turn off the on-site water supply
- Undo the screw connections on the cartridge
- Pull the mains plug of the conductivity meter
- Detach the conductivity meter from the cartridge
- Drain off the residual water in the cartridge
- Send used cartridges to one of the behropur stations for regeneration
- Connect a new cartridge → 1.4.1 Setting up the connections (page 3)



#### **WARNING**

*There is still some water in the hoses*

- Consumables → 8.2 Consumables (page 60) may be ordered from our service organisation

**1.8.3 behropur stations****Germany:**

Manufacturer

BEHR

Labor - Technik

Spangerstraße 8

40599 Düsseldorf

Tel.: (0211) 7 48 47 - 0

Fax: (0211) 7 48 97 72





## APPENDIX: HANDHOLE PORTS<sup>1)</sup>

### 1.1 Introduction

This appendix contains operating instructions for the handhole ports.

### 1.2 Description

#### 1.2.1 Design

The handhole ports in the test space door are used for sealing plugs with attached protective gloves for handling the test specimens.

#### 1.2.2 Function

The handhole ports enable handling of the test specimens during test operation, without opening the door.

### 1.3 Technical data

#### 1.3.1 Operative range

Use of the protective gloves is strictly limited to the following temperature range:

Minimum allowable operating temperature	Maximum allowable operating temperature
-30 °C	+80 °C

Use of the protective gloves is not permitted for temperatures outside the range specified in this table.



#### WARNING

*It is essential that the permissible temperatures be observed*



#### DANGER

*Use the protective gloves for short periods of time only. Remove them from the handhole ports after use, and seal the ports with standard plugs.*

1) option  
2) not assigned  
3) only for test systems with 600 ltr and more

## APPENDIX: TEMPERATURE SENSORS<sup>1)</sup>

### 1.1 Introduction

This appendix contains installation and operating instructions for temperature measurement on the test specimen.

### 1.2 Description

#### 1.2.1 Design

A mobile Pt 100 sensor is used for temperature measurement on the test specimen or any other place in the test space.

#### 1.2.2 Function

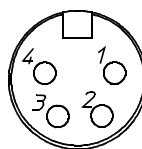
Plug the mobile temperature sensor into the assigned socket on the main switch panel → 2.2.8 *Main switch panel (page 13)* and lead it through the entry port into the test space. Fix it to a convenient spot in the test space or on the test specimen. The measured temperature values can be displayed on the control unit »Touchpanel« via menu »Special functions«, or called via interface RS 232 or free analog outputs.

### 1.3 Technical data

For measuring range (Temperature range of the test system)  
→ 3.5 *Characteristics for temperature tests (page 17)*.

The 4-pole socket is assigned as follows:

- Pt 100 1	Pin 1
+ Pt 100 1	Pin 2
Shield	Pin 3



Pin assignment, if Analog I/O<sup>1)</sup> is used, → *Appendix: Interface connections, (page 4)*

### 1.4 Preparation for initial operation

On delivery of the test system you will find the Pt 100 sensor in the test space. To connect it, proceed as follows:

- Insert the connector of the sensor into socket 1 on the main switch panel



#### NOTE

*If there are several sensors, use sockets 1 - 4 accordingly.*

- Lead the sensor through the entry port into the test space
- Fix it to a convenient spot in the test space or on the test specimen

**DANGER**

*Ensure there is no contact between the metal sleeve of the temperature sensor and any live parts.*

## **1.5 Putting into operation**

In addition to this manual, the operating manual for control unit »Touchpanel« must be observed prior to performing temperature measurement on the test specimen.

### **1.5.1 Display of temperature values on the control unit**

The actual temperature values are displayed on the control unit in the menu »Special functions« → »Measure values« → »Pt 100 No. 1 (...4)« → operating manual for control unit »Touchpanel«, chap. 3.3 »Special functions«.

### **1.5.2 Calling temperature values via interface RS 232 or analog outputs**

Proceed as follows:

- Call temperature value on on-site PC with software SIMPATI<sup>1)</sup>, or
- Use on-site recording equipment for printout

## **1.6 Putting out of operation**

- Exit menu »Measure values«
- Unplug sensor from the main switch panel
- Remove sensor from the test space

## **1.7 Fault diagnosis and rectification**

The sensor is monitored for fractures and short circuit by the controller. If a fault occurs, a temperature below -90 °C will be displayed. In this case, the sensor must be replaced.

## APPENDIX: CLARIFICATION DEVICE FOR HUMIDIFICATION PAN<sup>1)</sup>

### 1.1 Introduction

This appendix contains installation and operating instructions for the clarification device of the humidification pan.

### 1.2 Description

The test space floor is equipped with a humidification pan for the climatic conditioning of the test space.

#### 1.2.1 Design

The clarification device is used for draining the contaminated water from the humidification pan via a solenoid valve into a floor outlet on site.

#### 1.2.2 Function

In case of dirt or pollutant emission by the test specimen, the humidification water should be renewed at regular intervals.

There are two ways of renewing the humidification water:

##### **Complete water change**

During climatic operation, digital channel »Humidity« is switched off for approx. 1 minute. The solenoid valve opens and the contaminated humidification water discharges via an on-site hose at the overflow and condensate drain → *Fig. 1-1 Connection for on-site hose (page 2)*.

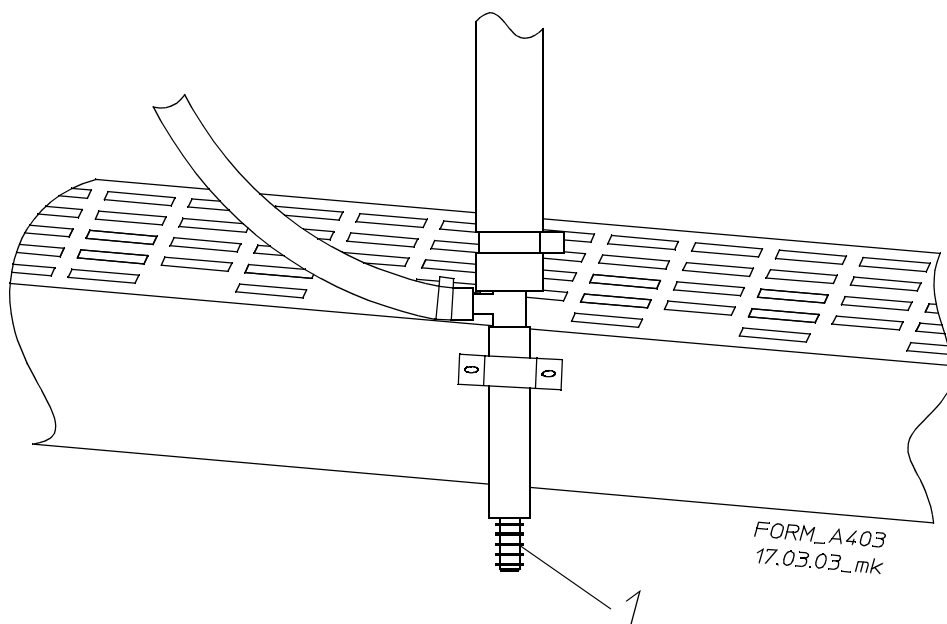
##### **Continuous water change**

The »Clarification« function enables the solenoid valve to open at certain intervals. The factory-set interval is 1200 s. It can be altered if required.

The non-adjustable opening time of the solenoid valve enables approx. 20 to 25 ml of humidification water to be discharged via an on-site hose at the overflow and condensate drain → *Fig. 1-1 Connection for on-site hose (page 2)*.

### 1.3 Preparation for initial operation

- Open the front flap
- Attach on-site hose to outlet connection (1) (overflow and condensate drain) and secure with hose clamp → *Fig. 1-1 Connection for on-site hose*
- Connect hose to a floor outlet



*Fig. 1-1  
Connection for on-site hose*



#### **WARNING**

*The overflow and condensate drain must be connected to a floor outlet*

## 1.4 Putting into operation

In addition to this manual, the operating instructions for the control unit »Touchpanel« must be observed.



### NOTE

*The clarification device can only be activated during climatic operation of the test system*

### 1.4.1 Complete water change

- Deactivate digital channel »Humidity« for approx. 1 minute, in automatic mode during program execution, or in manual mode.  
→ *Operating manual for control unit »Touchpanel«, chap. 2.6.*

### 1.4.2 Continuous water change

- Activate digital channel »Clarification«, in automatic mode during program execution, or in manual mode.
- Set the desired interval for solenoid valve opening in menu »Special functions« → »Set values« → »Clarification«. Values between 600 s and 4200 s are possible.  
→ *Operating manual for control unit »Touchpanel«, chap. 3.3.*





## APPENDIX: VARIABLE-SPEED TEST SPACE FAN<sup>1)</sup>

### 1.1 Introduction

This appendix contains installation and operating instructions for the test space fan with stepless speed variation.

### 1.2 Description

#### 1.2.1 Design

Speed variation is regulated by a frequency converter.

#### 1.2.2 Function

The stepless speed variation is used for reducing the quantity of circulating air. Variation ranges from 30% to 100% for temperature tests, 50% to 100% for climatic tests. The speed variation is activated on the control unit »Touchpanel«.

### 1.3 Technical data

Setting range:

for temperature tests: 30% to 100%

for climatic tests: 50% to 100%



#### **DANGER**

*The mains connection must have a separate protective copper conductor of min. 10 mm<sup>2</sup>*

(This applies only to test systems with a conductor size <10 mm<sup>2</sup>)



#### **NOTE**

*The performance data relating to temperature and humidity in chap. 3 Technical Data (page 15) cannot be guaranteed when the quantity of circulating air is reduced. In case of programmed test cycles, please note that on account of the reduced quantity of air the desired values cannot be achieved within the programmed time.*

1.4 Preparation for initial operation

The test system is supplied with a connecting cable for a non-detachable mains connection on site.

- Connect the cable to a non-detachable mains connection
- Connect the separate protective conductor at the back of the test system to the on-site PE terminal in accordance with VDE 0160, section 6.5 and EN 50178 (This applies only to test systems with a conductor size <10 mm<sup>2</sup>).



**DANGER**  
*The connection to the on-site power system must be performed by a skilled person*



**NOTE**  
*Connection to a residual-current circuit-breaker < 300 mA is not possible*

1.5 Putting into operation

1.5.1 Setting the speed on the control unit

Set the speed in the following menu:  
»Special functions« → »Set values« → »Fan speed«,  
for temperature tests from 30% to 100%, for climatic tests from 50% to 100%. Save the value.  
→ Operating manual »Touchpanel«, chap. 3.3.

1.6 Putting out of operation

Reset speed to 100%. For procedure → *Setting the speed on the control unit (page 2)*

1.7 Fault diagnosis and rectification

Fault	Cause	Rectification
The on-site r.c.d tripped	The pulsating d.c. controller affects the tripping function of the on-site residual-current-device	Use a suitable universal current r.c.d (see DIN VDE 0160 / EN 50178)

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1) option  
2) not assigned  
3) only for test systems with 600 ltr and more

## APPENDIX: ADDITIONAL HUMIDITY CONTROL WITH CAPACITIVE MEASURING SYSTEM<sup>1)</sup>

### 1.1 Introduction

This appendix contains installation and operating instructions for additional humidity control with a capacitive measuring system<sup>1)</sup>.

### 1.2 Description

#### 1.2.1 Design

The sensor of the capacitive measuring system<sup>1)</sup> is installed in the bottom floor of the test space.

#### 1.2.2 Function

In addition to the standard psychrometric device, the test system is equipped with a capacitive humidity measuring system<sup>1)</sup> which enables long-duration climatic tests. To put it into operation, activate digital channel »Capacitive sensor«.

### 1.3 Technical data

For humidity range for the capacitive humidity system<sup>1)</sup>:  
→ 3.6 *Characteristics for climatic tests (page 18)*

## 1.4 Putting into operation

In addition to this manual, the operating instructions for the test system and control unit »Touchpanel« must be observed prior to using the capacitive measuring system<sup>1)</sup>.

To put it into operation, proceed as follows:

- Activate digital channel »Humidity« und »Capacitive sensor«  
→ *operating manual »Touchpanel«, chap. 2.6*
- Input temperature and humidity setpoint on the control unit
- Start the test system



### NOTE

*The capacitive humidity measuring system can also be switched on or off via a test program → operating manual »Touchpanel« chap. 7.*

## 1.5 Putting out of operation

Proceed as follows:

- Press the »STOP« button
- Deactivate digital channel »Humidity« and »Capacitive sensor«

## APPENDIX: LEAD-THROUGH PAD<sup>1)</sup>

### 1.1 Introduction

This appendix contains operating instructions for the lead-through pad.

### 1.2 Description

#### 1.2.1 Design

To enable the introduction of individual cables, a lead-through pad is glued to the masking frame around the test space opening. The pad is designed for 5 cables, with a maximum diameter of 7 mm each.

#### 1.2.2 Function

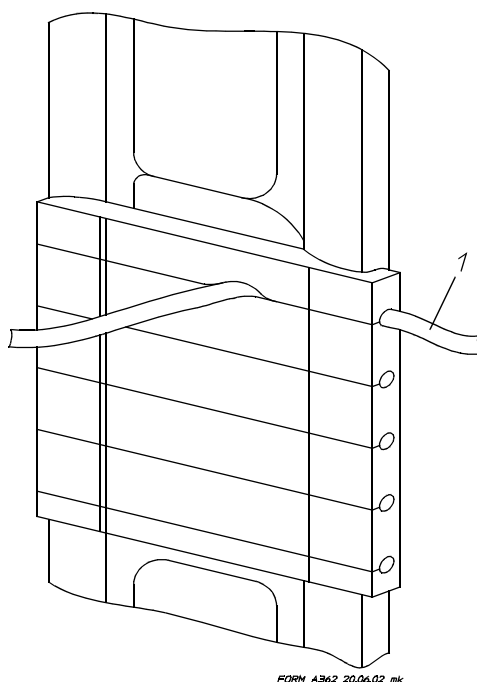
The lead-through pad enables cables to be introduced into the test space without separating the test specimen from the measuring equipment. The special shape of lead-through pad and masking frame ensure that the test space is sealed when the door is closed.

### 1.3 Technical data

Number of ports:	5
Diameter of cables:	2 to 7 mm

### 1.4 Inserting the cables

- Squeeze the individual cables (1) into the slots, starting at the edge  
→ Fig. 1-1 .



FORM\_A362 20.06.02\_mk

Fig. 1-1

## 1.5 Maintenance

### 1.5.1 Replacing the lead-through pad

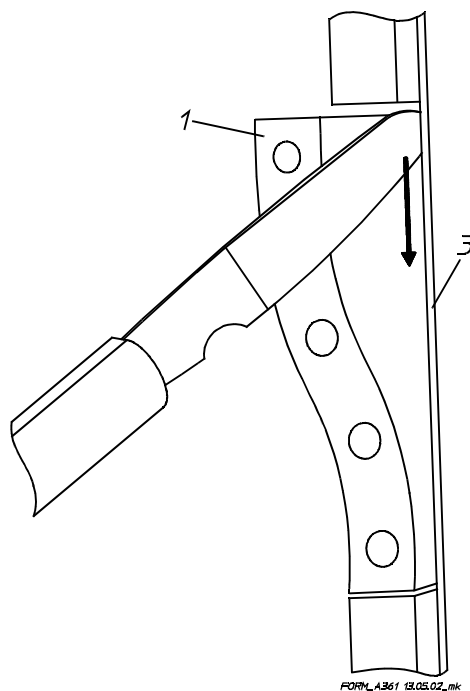
If the lead-through pad is damaged, replace it with the spare pad supplied, proceeding as follows:

- Detach the lead-through pad (1) from the masking frame (3) with a knife → Fig. 1-2 .



#### WARNING

*Be careful not to damage the test space seals*



FORM\_L436/1 13.05.02\_mk

Fig. 1-2

- Silicone residues on the masking frame may be removed with a knife

### Fitting a new lead-through pad

- Apply two lines of silicone (approx. 2 mm high) to the back of the lead-through pad → Fig. 1-3 .

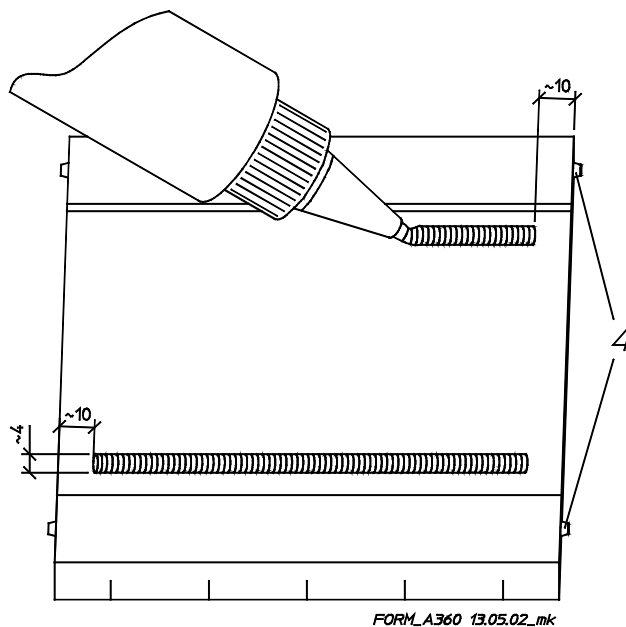


Fig. 1-3

- Insert the lead-through pad in the masking frame in such a manner that the slots remain accessible (they must be on the outside)
- Insert the lugs (4) of the lead-through pad into the recess of the test space seals
- Close the test space door
- Allow the silicone adhesive to set for approx. 24 h



#### NOTE

*Should the storage life of the silicone adhesive supplied be exceeded (12 months from date of delivery), you may use a regular transparent acetic acid-based silicone adhesive for fixing the lead-through pad.*

### 1.5.2 Consumables

Ordering code	Designation
62652002	Lead-through pad
60272309	Silicone adhesive





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<b><u>Deutschland</u></b>	Vötsch Industrietechnik GmbH Service Centre <b>D – 35447 Reiskirchen-Lindenstruth</b>	Tel: (0049) 06408 – 84-0 Fax: (0049) 06408 - 84 87 18 (Inland; Domestic) Fax: (0049) 06408 – 84 87 31 (Ausland; Abroad)
	or  Vötsch Industrietechnik GmbH Beethovenstraße 34 <b>D – 72336 Balingen-Frommern</b>	Tel: (0049) 07433 – 30 30 Fax: (0049) 07433 – 303 42 20
<b><u>Belgien</u></b>	Weiss Technik Belgium B.V.B.A. Begijnenmeers 63 <b>B - 1770 Liedekerke</b>	Tel: (0032-53) 68 10 10 Fax: (0032-53) 68 10 20 e-mail: <a href="mailto:sales@weisstechnik.be">sales@weisstechnik.be</a>
<b><u>Dänemark</u></b>	Beatronic Supply Industrivaenget 13 <b>DK - 3400 Hillerød</b>	Tel: (0045) 48 24 02 20 Fax: (0045) 48 24 13 14 e-mail: <a href="mailto:sale-dk@beatronic.com">sale-dk@beatronic.com</a>
<b><u>Finnland</u></b>	Amitra Oy Aniankatu 1 <b>SF - 15210 Lahti</b>	Tel: (00358) -3 -876 100 Fax: (00358) -3 -751 0253 e-mail: <a href="mailto:jukka.nikkanen@amitra.fi">jukka.nikkanen@amitra.fi</a>
<b><u>Frankreich</u></b>	Weiss Technik France 283, Route d'Andrézy Carrières-sous-Poissy B.P. 4015 <b>F-78955 Carrières Sous Poissy</b>	Tel: (0033-1) 34 01 11 00 Fax: (0033-1) 39 27 37 84 e-mail: <a href="mailto:info@weissfr.com">info@weissfr.com</a>
<b><u>Griechenland</u></b>	Analytical Instruments S.A. 9, Tzavella Str. 152 31 Chalandri <b>GR – Athens</b>	Tel: 0030/210/ 67 48 973-7 Fax: 0030/ 210/ 67 28 180 e-mail: <a href="mailto:contact@analytical.gr">contact@analytical.gr</a> e-mail: <a href="mailto:emil@analytical.gr">emil@analytical.gr</a>
<b><u>Großbritannien</u></b>	Weiss Technik Limited Willowbank House <b>SL7 1NX Marlow England</b>	Tel: (0044) 1494 43 43 24 Fax: (0044) 1494 43 43 25

<b><u>Irland</u></b>	Foss Electric (Ireland) Unit G13 Calmount Park Ballymount <b>IRL- Dublin 12</b>	Tel: (00353) 1 250 11 00 Fax: (00353) 1 250 11 99 e-mail: <a href="mailto:mail@foss.ie">mail@foss.ie</a>
<b><u>Italien</u></b>	Weiss Technik Italia S.r.l. Via Murri 22-28 <b>I - 20013 Magenta (MI)</b>	Tel: (0039) 02 97 291 616 Fax: (0039) 02 97 291 618 e-mail: <a href="mailto:info@weissitalia.it">info@weissitalia.it</a>
<b><u>Niederlande</u></b>	Weiss Enet B.V. Morsestraat 8 Postf. 6040 (4000 HA Tiel)  <b>NL -4004 JP Tiel</b>	Tel: (0031) 344 67 04 00 Tel. Technik: (0031) 344 65 38 80 Fax: (0031) 344 67  e-mail: <a href="mailto:info@weissenet.nl">info@weissenet.nl</a>
<b><u>Norwegen</u></b>	Diplom Ing. Houm As Postboks 83 Grefsen <b>N-0409 Oslo</b>	Tel: (0047) 22 09 40 00 Fax: (0047) 22 09 40 40 E-mail: <a href="mailto:firmapost@houm.no">firmapost@houm.no</a>
<b><u>Österreich</u></b>	Weiss Umwelttechnik Ges.m.b.H. Ober-Laaer Straße 316 <b>A - 1232 Wien</b>	Tel: (0043-1) 616 66 97 Fax: (0043-1) 616 66 97-13 e-mail: <a href="mailto:weiss.umwelttechnik-wien@schunk-group.com">weiss.umwelttechnik-wien@schunk-group.com</a>
<b><u>Portugal</u></b>	Heraeus S.A, Avenida. Dos Missionarios, 48 <b>P - 02735 Cacém</b>	Tel: (0035) 11 91 20 865 / 6 Fax: (0035) 11 91 20 860
<b><u>Schweden</u></b>	Axeb AB Test & Lab Hammarbaken 4, PF 437 (PF 437 ; 191 24 Sollentuna) <b>SE – 191 49 Sollentuna</b>	Tel: (0046) 8 585 77 75-0 Fax: (0046) 8 623 15 45 e-mail: <a href="mailto:admin@axeb.se">admin@axeb.se</a>
<b><u>Schweiz</u></b>	Weiss Technik AG Böndlerstr. 29 <b>CH-8802 Kilchberg</b>	Tel: (0041-1) 716 10 66 Fax: (0041-1) 716 10 76 e-mail: <a href="mailto:Info@weiss-technik.ch">Info@weiss-technik.</a>

<b><u>Spanien</u></b>	Heraeus S.A. Manuel Tovar, 24 <b>E - 28034 Madrid</b>	Tel: (0034)-91-3 58 19 96 Fax: (0034)-91-3 58 20 67 e-mail: <a href="mailto:industria@heraeus.es">industria@heraeus.es</a>
<b><u>Polen</u></b>	Beatronic Polska sp. z o.o. ul. Modlinska 190 <b>03-119 Warszawa</b>	Tel: (0048) 22 510 36 71 to 73 Fax: (0048) 22 510 36 74 e-mail: <a href="mailto:sale-pl@beatronic.com">sale-pl@beatronic.com</a> Homepage: <a href="http://www.beatronic.com">http://www.beatronic.com</a>
<b><u>Rumänien</u></b>	BUMBAS ELECTRIC SRL Str. VASILE LASCAR Nr. 216 Sector 2 <b>RO - 72102 Bucuresti</b>	Tel: (0040) 21 230 31 66 Fax: (0040) 21 211 67 55  e-mail: <a href="mailto:bumbas@ew.ro">bumbas@ew.ro</a>
<b><u>Russland</u></b>	Sovtest Mozhaevskaya Street 12 305000 Kursk Russland	Tel: 007-0712-54 54 17 Fax: 007-0712-56 35 50 e-mail: <a href="mailto:info@sovtest.ru">info@sovtest.ru</a>
<b><u>Serbien</u></b>	MINIX- DATA Trgovacka 20 <b>Yu -11000 Beograd</b>	Tel: (00381) 11 508-778 Fax: (00381) 11 506 966 (00381) 11 554 802
<b><u>Rep. Slowenien</u></b>	LT d.o.o. Trubarjeva 5 <b>SI - 8310 Sentjernej</b>	Tel: (00386) 7 33 72 150 Fax: (00386) 7 33 72 152 e-mail: <a href="mailto:stanko.mocnik@siol.net">stanko.mocnik@siol.net</a>
<b><u>Slowakische Rep.</u></b>	Comedis spol. s.r.o. Winterova 20 <b>SK - 921 01 Piestany</b>	Tel: (0042-1) 33 77 25 572 or (0042-1) 33 77 22 872 Fax: (0042-1) 33 77 40 106 e-mail: <a href="mailto:posta@comedis.sk">posta@comedis.sk</a>
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<b><u>Australien</u></b>	Radiometer Pacific Pty. Ltd. 212 Whitehorse Road <b>Blackburn 3130</b>	Tel: 0061/3/9259 2222 Fax: 0061/3/9894 8362 e-mail: <a href="mailto:info@radiometer.com.au">info@radiometer.com.au</a> <a href="mailto:service@rpac.aust.com">service@rpac.aust.com</a>
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<b><u>Brasilien</u></b>	SUPERLAB Instrumentacao Analitica Ltda Rua dos Cafezais, 732 <b>04364-000 - Sao Paulo – SP</b> <b>BR – Brasil</b>	Tel: 0055-11/5562 3210 Fax: 0055-11/5564 7405 e-mail: vendas@superlab.com.br
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<b><u>Thailand:</u></b>	<b>VIT</b> CentiForce (Thailand) Co. Ltd 144/23 Klongchan Place Serithai Road, Klongchan, Bangkapi Bangkok <b>Thailand</b>	Telefon: (00662) 377 0928 Telefax: (00662) 377 1209 e-mail: <a href="mailto:min.zaw@centiforce.com">min.zaw@centiforce.com</a>
<b><u>Türkei</u></b>	Incekara A. S. Principal Office 25. Sok. No. 16 N. Akar Mah. 06520 Balgat <b>Ankara</b>	Tel: 0090/312 295 2525 Fax: 0090/312 295 2500 e-mail: <a href="mailto:yislek@incekara.com.tr">yislek@incekara.com.tr</a>
<b><u>Tunesien</u></b>	Pimos S.A.R.L. 5, Rue Imam Sahnoun <b>Tunis-Belvédère</b>	Tel: 00216/1/288614 Telex: 0409/14025 Telegram.: PIMOS, Tunis
<b><u>Uruguay</u></b>	<b>- Biology -</b> CAM Centro de Abastecimento Medico Avda. Italia 2958 Esq. Las Heras <b>Montevideo</b>	Tel: 005982/812728 005982/810460
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**Vietnam**

Ministry of Science Technology and  
Environment (Technimex)  
Vietnam Technique Import Export  
70 Tran Hung Dao

**Hanoi**  
**Vietnam**

Tel: (0084)-4-8223-509  
Fax: (0084)-4-8220-377

Corp.e-mail: techhanoi@hn.vnn.vn





**Vötsch Industrietechnik GmbH**  
Umweltsimulation • Wärmetechnik

Frommern, Beethovenstraße 34  
D-72336 Balingen

Postfachadresse:  
Postfach 10 04 53, D-72304 Balingen

Telefon: (07433) 303-0  
Telefax: (07433) 303-112

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